HARRIS

PROFESSIONAL ELECTRONICS COMPANY
2469 Albany Street
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OPERATOR'S MANUAL

TC-90

COLOR CAMERA

TECHNICAL MANUAL

TC-90 COLOR CAMERA SYSTEM

OPERATORS MANUAL

994-8680-001/002

HARRIS

T.M. No. 888-2160-001

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WARNING

THE CURRENTS AND VOLTAGES IN THIS EQUIPMENT ARE DANGEROUS. PERSONNEL MUST AT ALL TIMES OBSERVE SAFETY REGULATIONS.

This manual is intended as a general guide for trained and qualified personnel who are aware of the dangers inherent in handling potentially hazardous electrical/electronic circuits. It is not intended to contain a complete statement of all safety precautions which should be observed by personnel in using this or other electronic equipment.

The installation, operation, maintenance and service of this equipment involves risks both to personnel and equipment, and must be performed only by qualified personnel exercising due care. HARRIS CORPORATION shall not be responsible for injury or damage resulting from improper procedures or from the use of improperly trained or inexperienced personnel performing such tasks.

During installation and operation of this equipment, local building codes and fire protection standards must be observed. The following National Fire Protection Association (NFPA) standards are recommended as references:

- Automatic Fire Detectors, No. 72E
- Installation, Maintenance, and Use of Portable Fire Extinguishers, No. 10
- Halogenated Fire Extinguishing Agent Systems, No. 12A

WARNING

ALWAYS DISCONNECT POWER BEFORE OPENING COVERS, DOORS, ENCLOSURES, GATES, PANELS OR SHIELDS. ALWAYS USE GROUNDING STICKS AND SHORT OUT HIGH VOLTAGE POINTS BEFORE SERVICING. NEVER MAKE INTERNAL ADJUSTMENTS, PERFORM MAINTENANCE OR SERVICE WHEN ALONE OR WHEN FATIGUED.

Do not remove, short-circuit or tamper with interlock switches on access covers, doors, enclosures, gates, panels or shields. Keep away from live circuits, know your equipment and don't take chances.

WARNING

IN CASE OF EMERGENCY ENSURE THAT POWER HAS BEEN DISCONNECTED.

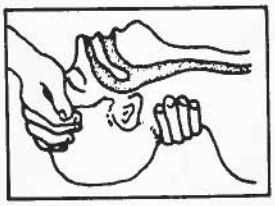
Treatment of Electrical Shock

1. If victim is not responsive follow the A-B-Cs of basic life support.

PLACE VICTIM FLAT ON HIS BACK ON A HARD SURFACE

(A) AIRWAY

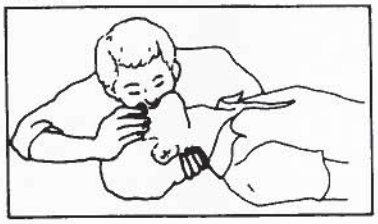
IF UNCONSCIOUS,
OPEN AIRWAY



LIFT UP NECK
PUSH FOREHEAD BACK
CLEAR OUT MOUTH IF NECESSARY
OBSERVE FOR BREATHING

(B) BREATHING

IF NOT BREATHING,
BEGIN ARTIFICIAL
BREATHING



TILT HEAD
PINCH NOSTRILS
MAKE AIRTIGHT SEAL

4 QUICK FULL BREATHS

REMEMBER MOUTH TO MOUTH RESUSCITATION
MUST BE COMMENCED AS SOON AS POSSIBLE

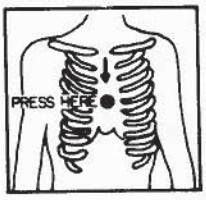
CHECK CAROTID PULSE



IF PULSE ABSENT,
BEGIN ARTIFICIAL
CIRCULATION

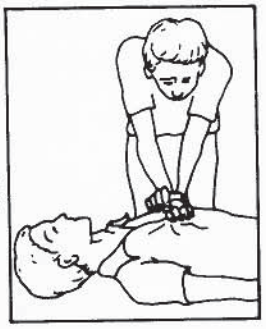
(C) CIRCULATION

DEPRESS STERNUM 1 1/2" TO 2"



APPROX. 80 SEC. { ONE RESCUER, 15 COMPRESSIONS, 2 QUICK BREATHS

APPROX. 60 SEC. { TWO RESCUERS, 5 COMPRESSIONS, 1 BREATH



NOTE: DO NOT INTERRUPT RHYTHM OF COMPRESSIONS
WHEN SECOND PERSON IS GIVING BREATH

Call for medical assistance as soon as possible.

2. If victim is responsive.

   a. keep them warm
   b. keep them as quiet as possible
   c. loosen their clothing
      (a reclining position is recommended)

FIRST-AID

Personnel engaged in the installation, operation, maintenance or servicing of this equipment are urged to become familiar with first-aid theory and practices. The following information is not intended to be complete first-aid procedures, it is brief and is only to be used as a reference. It is the duty of all personnel using the equipment to be prepared to give adequate Emergency First Aid and thereby prevent avoidable loss of life.

Treatment of Electrical Burns

1. Extensive burned and broken skin

   a. Cover area with clean sheet or cloth. (Cleanest available cloth article.)
   b. Do not break blisters, remove tissue, remove adhered particles of clothing, or apply any salve or ointment.
   c. Treat victim for shock as required.
   d. Arrange transportation to a hospital as quickly as possible.
   e. If arms or legs are affected keep them elevated.

NOTE

If medical help will not be available within an hour and the victim is conscious and not vomiting, give him a weak solution of salt and soda: 1 level teaspoonful of salt and 1/2 level teaspoonful of baking soda to each quart of water (neither hot or cold). Allow victim to sip slowly about 4 ounces (a half of glass) over a period of 15 minutes. Discontinue fluid if vomiting occurs. (Do not give alcohol.)

2. Less severe burns - (1st & 2nd degree)

   a. Apply cool (not ice cold) compresses using the cleanest available cloth article.
   b. Do not break blisters, remove tissue, remove adhered particles of clothing, or apply salve or ointment.
   c. Apply clean dry dressing if necessary.
   d. Treat victim for shock as required.
   e. Arrange transportation to a hospital as quickly as possible.
   f. If arms or legs are affected keep them elevated.

REFERENCE: ILLINOIS HEART ASSOCIATION

AMERICAN RED CROSS STANDARD FIRST AID AND PERSONAL SAFETY MANUAL (SECOND EDITION)

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SECTION I

GENERAL DESCRIPTION

1-1. INTRODUCTION

1-2. GENERAL

1-3. This Operators Technical Manual contains all the information necessary to assemble and operate the HARRIS TC-90 COLOR CAMERA SYSTEM. Figure 1-1 shows the camera ready for Electronic News Gathering (ENG) use. The various sections of this manual contain the following information.

a. SECTION I, GENERAL DESCRIPTION. Describes the equipment, identifies major assemblies, lists specifications, and describes optional capabilities.

b. SECTION II, PREPARATION FOR USE. Provides information for incoming inspection, power requirements, input/output connections, component mounting instruction, and initial setup.

c. SECTION III, OPERATION. Identifies control/switch functions, describes typical operating methods, outlines setup procedures, and discusses the use of accessories and interfacing with videotape recorders.

1-4. EQUIPMENT PURPOSE

1-5. The HARRIS TC-90 COLOR CAMERA SYSTEM is intended for use in broadcast Electronic News Gathering (ENG) and Electronic Field Production (EFP) systems or in any application requiring a very small, portable color camera of extreme stability, high picture quality, and light weight.

1-6. CAMERA SYSTEM DESCRIPTION

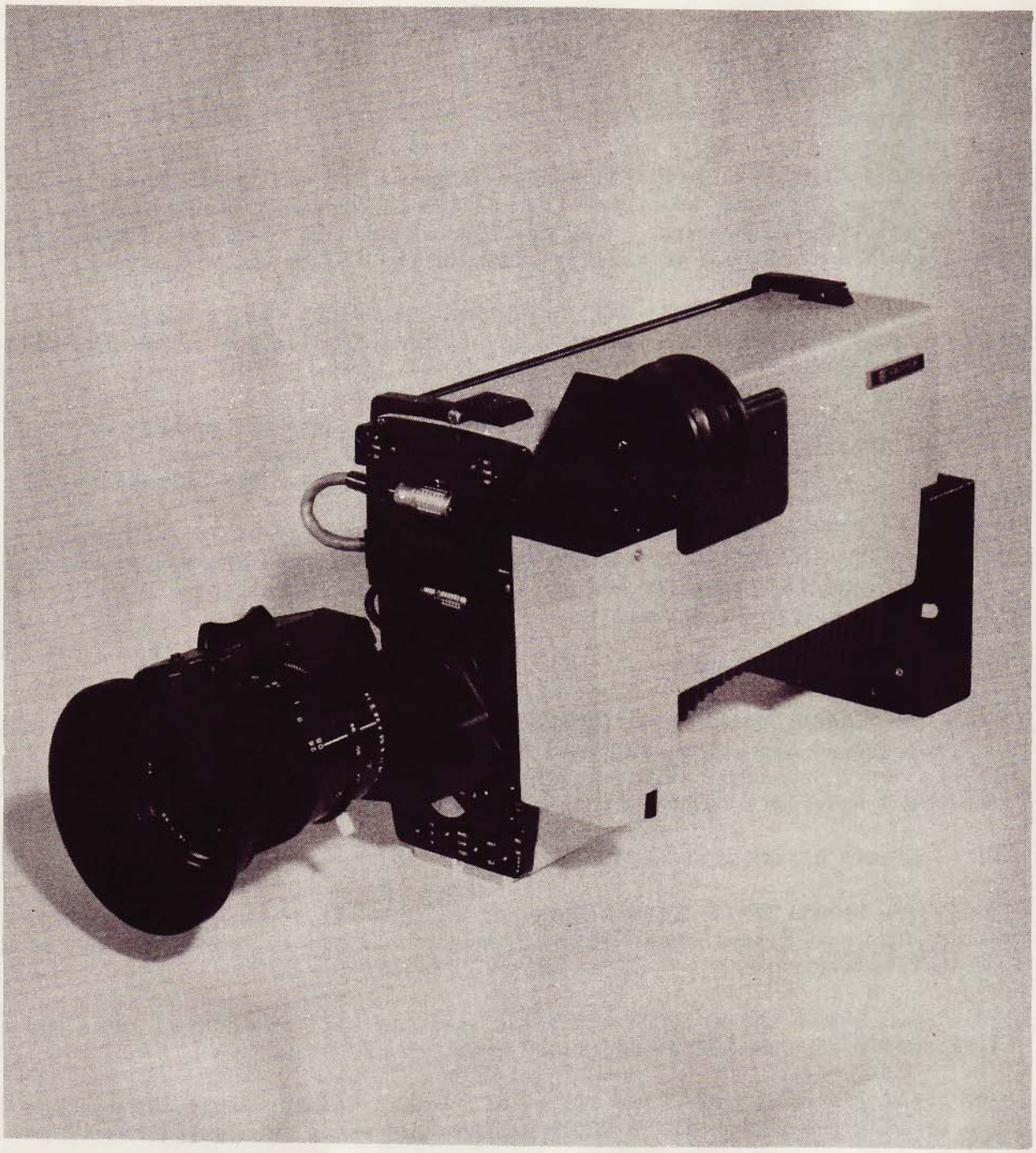
1-7. The HARRIS TC-90 COLOR CAMERA has a sealed f1.4 prism beam splitter with a built-in filter wheel and is designed to use Plumbicon* tubes of the 1/2-inch (13mm) size.

1-8. The HARRIS TC-90 COLOR CAMERA is equipped with automatic, white and black, color balance and an automatic iris servo system.

1-9. All lenses intended for use with 1/2-inch (13mm) format cameras may be used with the HARRIS TC-90 COLOR CAMERA, but the electrical connection must be made through a compatible plug.

*TM N.V. Philips

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TC-90 ENG Use Configureation

Figure 1-1

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1-10. For EFP use, an optional 5-inch (diagonal) viewfinder may be installed on the camera. If remote control is required, an optional CAMERA CONTROL UNIT (CCU) may be installed which allows control of 16 camera functions up to 5000 feet away through a single coaxial cable. The camera has a built-in gen-lock system to allow multiple camera use into a switcher.

1-11. For ENG use, the camera is equipped with a 1-1/2 inch (diagonal) viewfinder which is viewed through a magnifying optical assembly.

1-12. PHYSICAL DESCRIPTION

1-13. The basic HARRIS TC-90 COLOR CAMERA consists of a completely self-contained color television pickup system. The major components of the system, as shown in Figure 1-2, are as follows:

a. The zoom lens.
b. The camera body.
c. The viewfinder.
d. The power source.

1-14. The camera body, with tubes installed, weighs under 8 pounds (3.6kg). With a typical zoom lens, viewfinder, and a 2-ampere-hour nicad battery pack, the total weight is approximately 13.5 lbs(6.1kg). This is approximately the weight of most presently used ENG cameras without lens and battery pack.

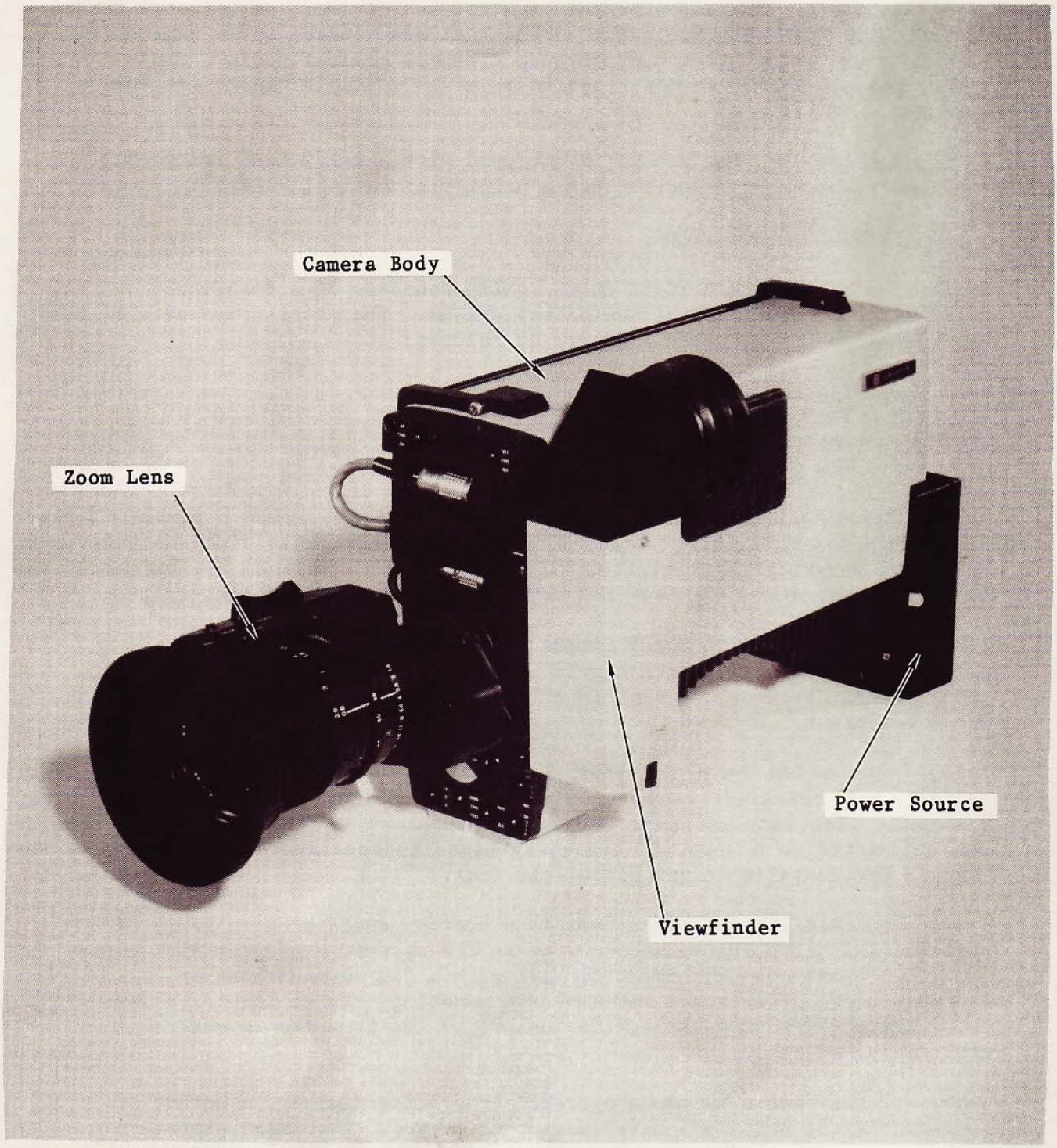
1-15. The HARRIS TC-90 COLOR CAMERA is housed in an extremely tough graphite-filament case which should never require maintenance or replacement. Because the case is of one-piece construction, the camera is water resistant.

1-16. The prism beam splitter is mounted to the magnesium alloy front casting and contains a built-in 5-position filter wheel including a cap position. The lens mount is the same as most other 1/2-inch format cameras and is mounted on a separate breakaway plate to facilitate replacement if the lens is accidentally broken off of the camera.

1-17. The rear of the camera body is a casting containing an array of switches and jacks for connections to an EFP system, a program microphone jack, and a battery pack mount for use with a four-ampere-hour or 2-ampere-hour battery pack for on-board mounting. An ac adapter power pack may also be used when it is desired to run from the commercial power line.

1-18. If the camera is to be operated from battery power, a method of re-charging the battery pack(s) must be provided. The least expensive method is to use a trickle charger. The disadvantage is that it will only charge one pack at a time and it takes overnight to fully charge an exhausted pack. The most satisfactory method is to use a multiple battery charging system.

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TC-90 Showing Major Components

Figure 1-2

WARNING: Disconnect primary power prior to servicing.

1-19. The HARRIS TC-90 COLOR CAMERA may be used with field-type videotape recorders and is equipped with a 14-pin connector for interface to them. Through a power select switch on the camera, the camera may be operated either from its own on-board battery pack or from the VTR battery.

1-20. Any lens designed for use with the 1/2-inch (13 mm) optical format, with a back focal length (including glasspath) of 48.87mm, may be adapted for use the the HARRIS TC-90 COLOR CAMERA. Other requirements are a compatible electrical connector (Lemo) and a compatible bayonet mount arrangement. The connector, required voltages, and mount are similar to other 1/2-inch format cameras of various manufacture.

1-21. EQUIPMENT CHARACTERISTICS

1-22. ELECTRICAL CHARACTERISTICS

1-23. Refer to Table 1-1 for Electrical Characteristics.

1-24. MECHANICAL/ENVIRONMENTAL CHARACTERISTICS

1-25. Refer to Table 1-2 for Mechanical/Enviromental Characteristics.

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Table 1-1. Electrical Characteristics

Specifications subject to change without notice.

FUNCTION	CHARACTERISTIC
SCAN STANDARDS:	EIA 525/60 CCIR 625/50
COLOR STANDARDS:	NTSC PAL-B
SENSITIVITY:*	3200°K incident light on a 60% reflectance Munsell white chip to make 100 IRE units of video at f1.4 lens iris setting and 0dB gain.
REGISTRATION:*	Zone 1 0.1% of a diameter equal to picture height. Zone 2 0.2% of a diameter equal to picture width. Zone 3 0.3% of the remaining area.
GEOMETRY:*	1.0% all three zones (lens distortion excluded) *Typical with average set of pickup tubes

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Table 1-1. Electrical Characteristics (Continued)

Specifications subject to change without notice.

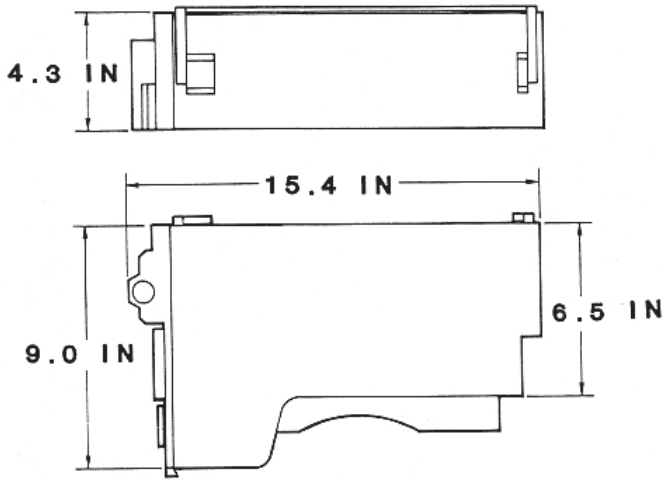
FUNCTION	CHARACTERISTIC
SIGNAL TO NOISE RATIO:*	Measured with Rhode and Schwarz noise meter with subcarrier and 10 kHz traps. Gamma = 1.0, contours off, flat bandwidth to 4.2 mHz, lens capped and 0db gain.
NTSC	-56 db
PAL-B	-54 db
RESOLUTION:*	Green channel, center, contours off, Gamma = 1.0.
Limiting Resolution Center (with contour correction)	600 TV Lines
POWER:	
Input Voltage	12 Vdc nominal (10.7 to 15 Vdc)
Power Consumption	
Plumbicon	22 Watts
Standby	3 Watts
*Typical with average set of pickup tubes.	

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Table 1-2. Mechanical/Environmental Characteristics

Specifications subject to change without notice.

FUNCTION	CHARACTERISTIC
WEIGHT:	
Camera with tubes Less lens and battery	Plumbicon 8 lbs.(3.6 kg)
Viewfinder	1.0 lbs 0.45 kg
ENVIRONMENTAL:	
Ambient Operating Temp	-20°C to +50°C -4°F to +122°F
Maximum Relative Humidity	90% noncondensing
Maximum Altitude	15,000 ft. (4572m)
Stability	Will meet specifications over a +/- 15°C (+/- 27°F) range from setup ambient.
DIMENSIONS:	
Length	15.4 inches, 388 mm
Height (optics area)	9.0 inches, 225 mm
Height (rear area)	6.5 inches, 163 mm
Width	4.3 inches, 108mm



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SECTION II

INSTALLATION

2-1. GENERAL

2-2. This section contains information on the examination, unpacking, and installation of the HARRIS TC-90 COLOR CAMERA SYSTEM. Instruction for system interconnection are provided including illustrations showing the cabling assignments for the various equipment items and the inputs required from the user. The initial setup procedure, including essential adjustments of signal levels is detailed. During installation of the equipment, standard safety practices are to be used, and strict adherance to the cautionary notes specified in the procedures is stressed.

2-3. INCOMING INSPECTION AND UNPACKING

2-4. Domestic shipment of the equipment is normally conducted via private carrier. The camera less the lens is shipped in a separte heavy-duty container with the pickup tubes and modules mounted in the housing.

2-5. Care should be exercised in unloading the equipment to prevent injury to personnel or damage to the equipment. Upon delivery, the shipping containers should be examined for indications of possible mishandling. If damage is evident, immediately notify the carrier and HARRIS CORPORATION Broadcast Division (refer to paragraph 2-9, Returns and Exchanges).

2-6. UNPACKING

2-7. Proper handtools are to be used in unpacking the equipment. To prevent damage to the equipment finish, do not use a knife or other sharp utensil to remove the protective material. The containers are to be opened from the top, and the equipment carefully removed. The control tags attached to the equipment are to be checked against the Packing Check List to verify that the shipment is complete. Any discrepancy is to be reported immediately to HARRIS CORPORATION Broadcast Division (refer to paragraph 2-9).

2-8. During removal of the system components from the containers, inspect them for obvious defects, missing parts, and loose or incorrect hardware.

2-9. RETURNS AND EXCHANGES

2-10. Damaged or undamaged equipment should not be returned unless written approval and a Return Authorization is received from HARRIS CORPORATION, Broadcast Division. Special shipping instructions and coding will be provided to assure proper handling. Complete details regarding circumstances and reasons for return are to be included in the request for return. Custom equipment or special order equipment is not returnable. In those instances where return or exchange of equipment is at the request of the customer, or convenience of the customer, a restocking fee will be charged. All returns will be sent freight prepaid and properly insured by

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the customer. When communicating with HARRIS CORPORATION Broadcast Division, specify the Factory Order Number or Invoice Number.

2-11. PREPARATION FOR USE

WARNING

DO NOT REMOVE CAMERA AND/OR VIEWFINDER CASE. ALL OPERATOR CONTROLS ARE EXTERNALLY ACCESSABLE. REMOVAL OF CASE EXPOSES HAZARDOUS VOLTAGES AND MAY RESULT IN PERSONAL INJURY AND/ OR EQUIPMENT DAMAGE.

2-12. LENS MOUNTING

2-13. The HARRIS TC-90 COLOR CAMERA is designed to use lenses of 1/2-inch (13mm) format from Angenieux, Canon, Fujinon, or Schneider. The lenses must work at a back focal length of 48.87mm, including glass path, and must be equipped with a 7-pin Lemo connector appropriately wired to interface with the camera. The connection cable of the lens must be approximately 12 to 13 inches long, including the plug.

2-14. To install a lens, locate the locking ring with tab on the camera front plate as shown in Figure 2-1. Rotate the locking ring as far counterclockwise (CCW) as it will go, viewed from the front. Insert the lens into the lens mount so the zoom rocker switch is on the left when facing the front of the camera. When the lens is seated in the mount, rotate the locking ring clockwise (CW), as viewed from the front, to secure the lens in place.

2-15. The cable must be dressed properly before inserting the plug into the camera socket. To do this, wrap the cable once around the rear of the lens barrel in the CCW direction, when viewed from the front. Form the end into a hairpin and insert the plug into the socket, being sure the red marks on the plug and socket are lined up before seating the plug. By dressing the cable as described, a neat installation,not prone to snagging,is achieved.

2-16. VIEWFINDER MOUNTING

2-17. The ENG Version Viewfinder mounts to the camera front plate. Feed the connector cable through the access hole from the right side of the camera as viewed from the front. Insert the viewfinder mounting tube into the mounting hole approximately one inch with the viewing lens eyepiece towards the rear of the camera. At this time a slight amount of drag should be encountered. Refer to figure 2-2. Align the red marks on the viewfinder connector cable plug with the red marks on the camera socket and insert the plug.

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2-18. ENG VIEWFINDER ADJUSTMENTS

2-19. The Viewfinder has a lateral adjustsment of approximately 1.5 inches for operator viewing comfort. This adjustment may be accomplished by moving the viewfinder tube in or out of the mount. The Viewfinder may also be rotated 90 degrees up or 90 degrees down from the vertical position. The Viewfinder may also be lowered approximately 1 inch by removing the two screws that secure the Viewfinder to the mounting tube and reinstalling them into the two upper holes.

CAUTION

DO NOT ROTATE THE VIEWFINDER BEYOND 90 DEGREES. EXCESSIVE STRESS ON THE CABLE AND THE CONNECTOR MAY RESULT.

2-20. Viewfinder position holding is accomplished by the compression of a nylon plug against the Viewfinder mounting tube. Should a compression adjustment be desired. Refer to the TC-90 Maintanence Manual T.M. No. 888-2161-001.

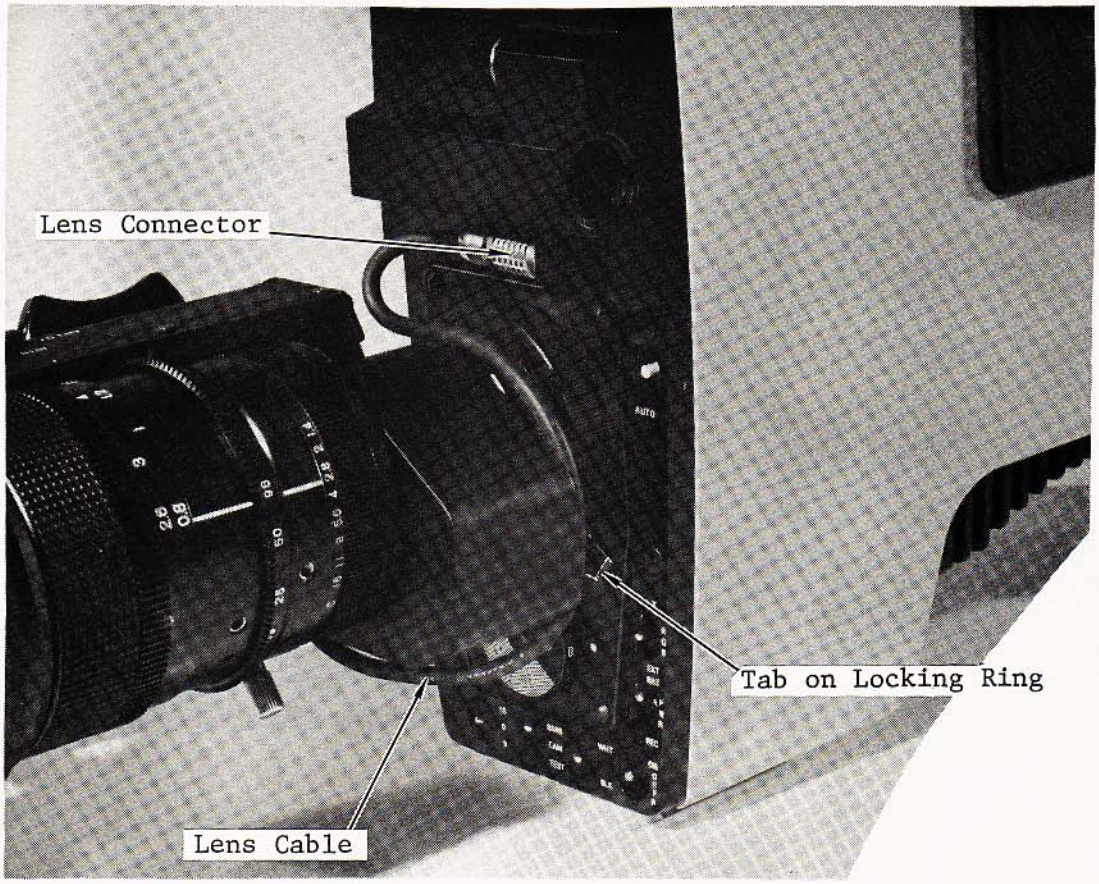


Figure 2-1. Installation of the Lens

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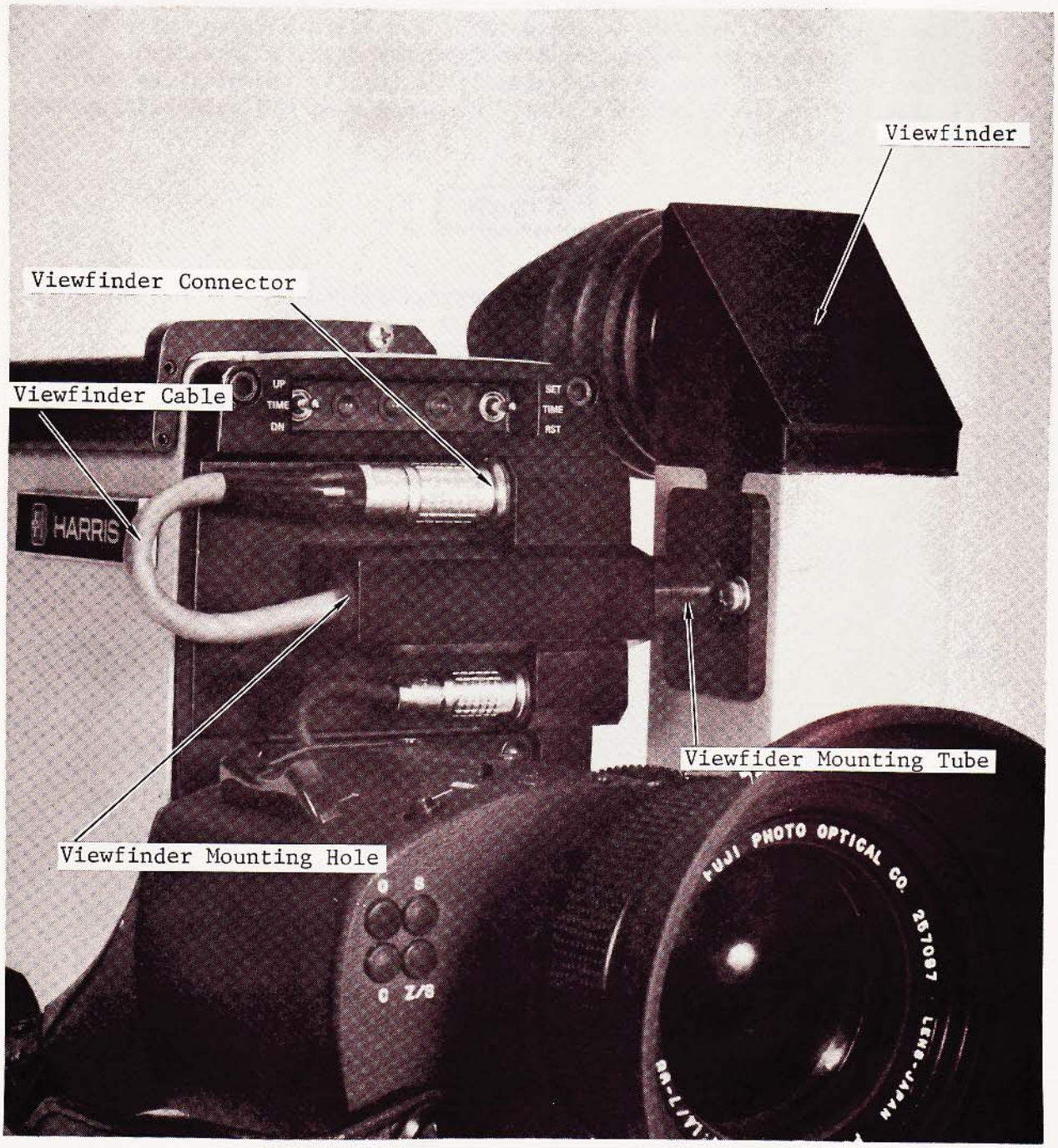


Figure 2-2. Mounting the Viewfinder

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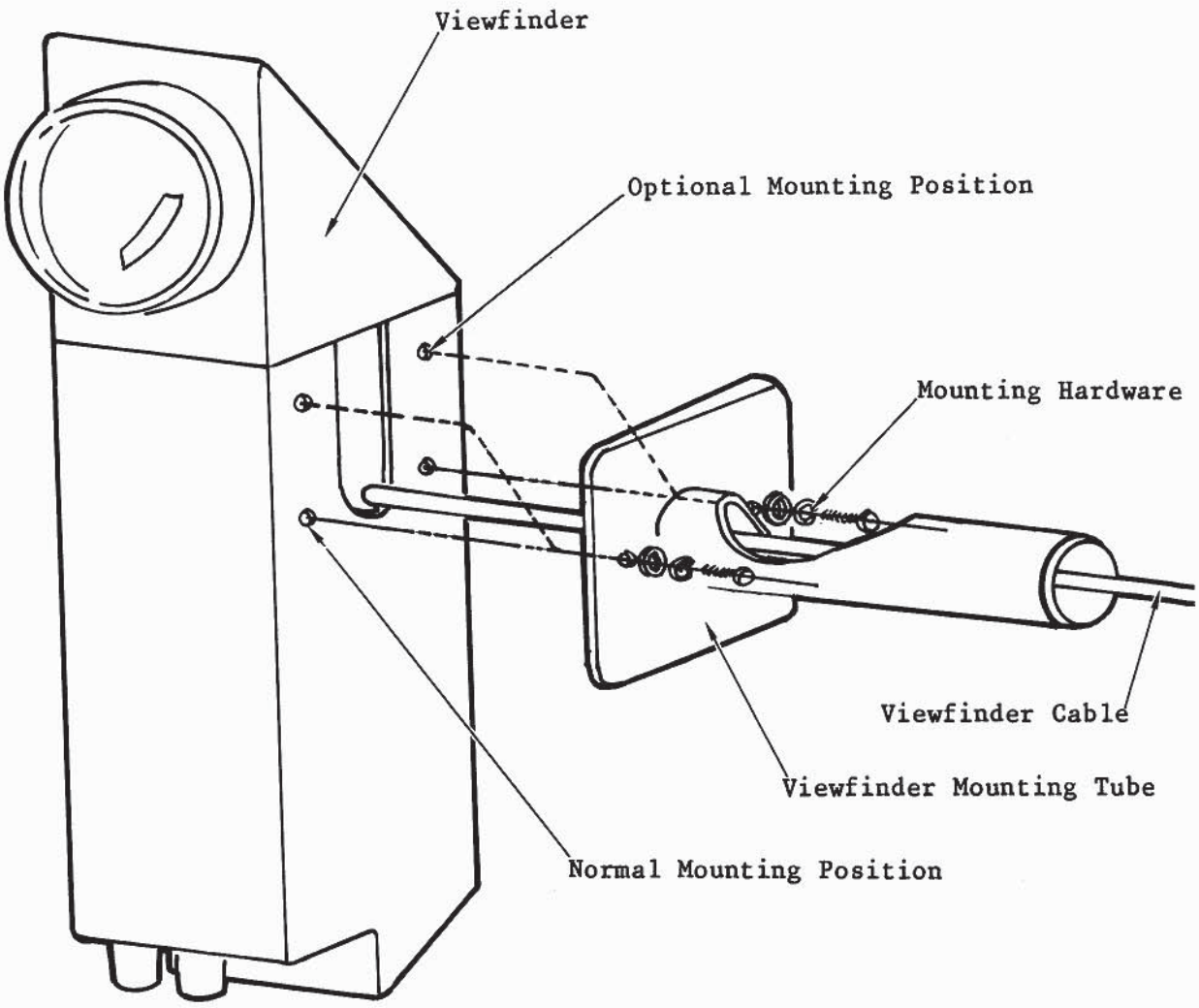


Figure 2-3. Adjusting the Viewfinder

WARNING: Disconnect primary power prior to servicing.

2-21. POWER SOURCE MOUNTING

2-22. To attach the battery pack to the camera, note the connector block on the rear side of the pack containing three holes for the entry of banana plugs mounted on the rear of the camera. Also note the three mounting ears for engagement with holes in the battery bracket on camera rear. Set the camera power switch to OFF.

2-23. Insert the three mounting ears on the battery pack into the holes in the battery bracket. Slide the pack firmly to the left until the banana plugs on the bracket enter the holes in the battery pack connector block. When the pack is properly seated, a audible "click" sound will be heard indicating the spring-loaded catch has seated.

2-24. To remove the battery pack, depress the spring-catch release lever at the left side of the pack. While holding the lever in the depressed position, slide the pack firmly to the right to disengage it from the camera.

WARNING

DISCONNECT THE AC POWER PACK CORD FROM THE AC POWER SOURCE BEFORE ATTACHING OR DETACHING THE AC POWER PACK FROM THE CAMERA.

2-25. The AC power pack is mounted in the same manner as the battery pack. Be sure both the camera power switch and the ac power pack switch are set to the OFF position before attaching or detaching the ac power pack.

2-26. Refer to Figure 2-4 for the attachment technique for the power options.

2-27. INITIAL SETUP AND CHECKOUT

2-28. Initial control and switch settings are as follows:

a. Rear panel

1. R/OFF/B operate to OFF

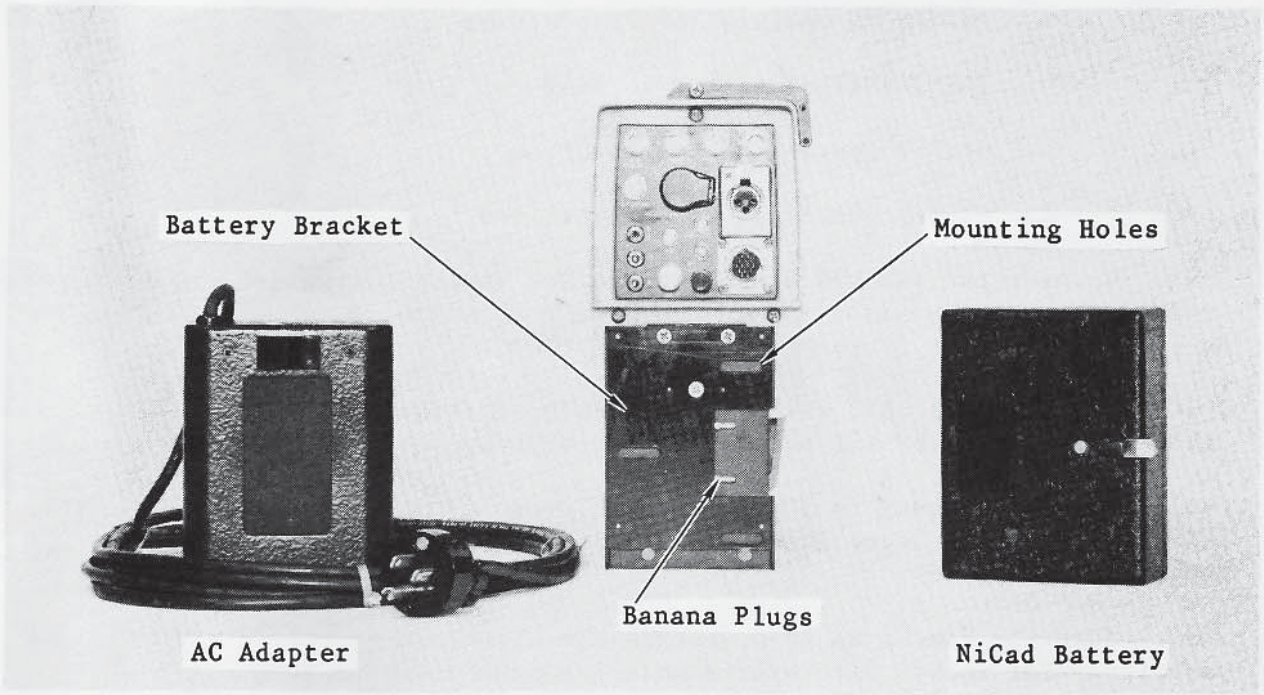
2. G/OFF/-G operate to G

b. Front panel

1. Y/RGB/EXT operate to Y position

2. BAT/REC operate to BAT position

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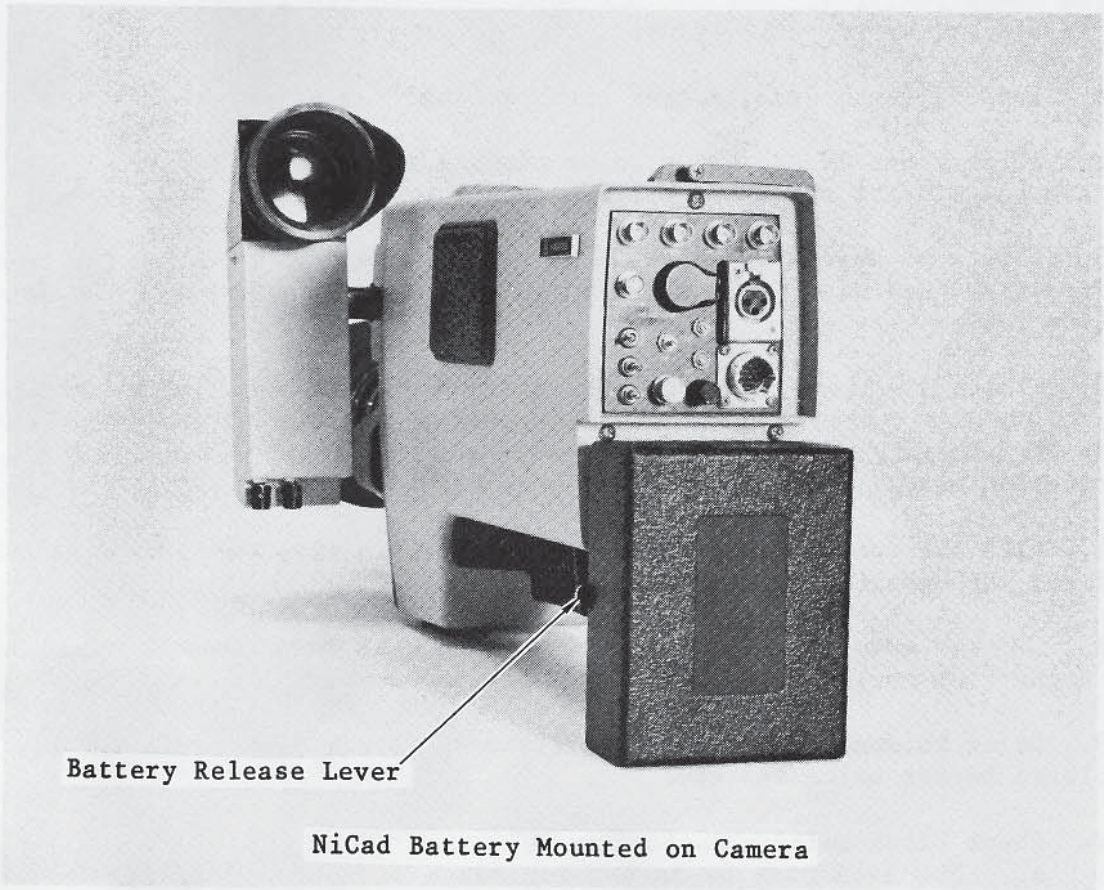


Figure 2-4. Installation of Power Options

WARNING: Disconnect primary power prior to servicing.

3. ON/OFF/SB operate to OFF position

4. BARS/CAM/TEST switch to BARS

5. 18/0/9 operate to 0dB position

6. Filter wheel set to CAP position

2-29. Connect the VID OUT connector, on the camera rear panel, to an appropriate color monitor (NTSC, PAL) through a length of 75-ohm coax cable. Be sure the monitor is terminated into 75-ohms.

2-30 Set the lens IRIS switch to the AUTO position. Set the ZOOM, SERVO/MANUAL actuator (if the lens is so equipped) to the SERVO position.

2-31. Move the camera to a well lighted area, either indoors or out. If indoors, the light level should be at least 100-foot candles for these intitial checks.

2-32. Turn the camera on by operating the ON/OFF/SB switch to the ON position. For indoor lights at a color temperature of 3200°K (Quartz-Iodine or Halogen lamps), rotate the filter wheel on the front panel to the CLEAR position. For outdoor locations, rotate the filter wheel to DAY if cloudy, or to .8 if sunny.

2-33. Support the camera, either with the shoulder or any steady surface.

2-34. After about 30 seconds a color picture should appear on the color monitor and a black and white picture should appear on the viewfinder.

2-35. Locate an object at least 10 feet from camera. Zoom for the narrowest angle picture and adjust the focus ring,located at the front of the lens, for optimum focus.

2-36. Track the zoom lens by activating the zoom control switch for the widest angle picture. Optimize the focus at the wide angle with the back focus adjustment, located at the rear of the lens. Refer to the lens instruction manual for the location.

2-37. With the two previous steps completed correctly, the lens will stay in focus throughout the zoom range.

2-38. If the camera-to-subject distance changes more than a small amount, the focus ring must be readjusted for optimum focus.

2-39. Color balance should now be performed. Black balance should always be completed before white balance.

2-40. Check black balance as follows:

a. The lens must be capped for black balance. This may be accomplished operating the filter wheel to the CAP position, or the lens may be set to AUTO iris.

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b. After capping or switching the lens to AUTO iris, depress the WHT/BLK switch to the BLK position and release it.

c. A built-in time delay of 3 seconds will be actuated, whereupon the cursor will appear in the viewfinder.

d. When the cursor extinguishes, black balance is completed. The filter wheel may now be operated to an operating position.

e. If the lens was set to AUTO iris, the entire capping and uncapping sequence is accomplished automatically. The lens iris closes completely during the 3-second time delay and opens to its previous setting after balance is completed.

2-41. Check white balance as follows:

a. Aim the camera at a white or neutral gray area of the scene.

b. Raise the WHT/BLK switch to the WHT position and observe the cursor line in the viewfinder.

c. While holding the switch in the WHT position, center the cursor in the white or gray area of the scene by moving the camera.

d. Release the switch and hold the camera steady until the cursor extinguishes. This should occur in about 0.15 seconds. The camera should now be white balanced.

e. The white or gray area should be large enough to include the entire cursor and contain little or no detail. Use the zoom as required to accomplish this.

2-42. The camera should now be ready for self-contained operation.

2-43. Refer to Section III, OPERATION, for a detailed explanation of camera use in various applications.

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SECTION III

OPERATION

3-1. GENERAL

3-2. The HARRIS TC-90 COLOR CAMERA is designed for use in a variety of applications including both Electronic News Gathering (ENG) and Electronic Field Production (EFP).

3-3. ENG use is a self-contained mode wherein all control, sync generator, and video processing is contained within the camera. An on-board Nicad battery pack provides the camera power. The video output from the camera is connected to a VTR/VCR, microwave or other terminal. A program microphone may be used to feed the program line.

3-4. EFP use involves intercom interconnection, tally interconnection,an optional remote control system, and an optional 5-inch viewfinder. A means of gen-locking the camera to other cameras or video sources is provided. This mode allows use of the camera in a studio situation or a multiple camera on-site situation.

3-5. CONTROLS, SWITCHES, AND CONNECTORS

3-6. REAR PANEL

3-7. Refer to Figure 3-1 and Table 3-1 for rear panel controls, switches, and connectors.

3-8. FRONT PANEL

3-9. Refer to Figure 3-2 and Table 3-2 for front panel controls, switches, and connectors.

3-10. ENG OPERATION

3-11. A list of all accessories available for use with the HARRIS TC-90 COLOR CAMERA in both the Electronic News Gathering (ENG) mode and the Electronic Field Production (EFP) mode is available from HARRIS CORPORATION. Contact your HARRIS represenative

3-12. Referring to Figure 3-3, note that the HARRIS TC-90 COLOR CAMERA may be tripod mounted by use of the tripod mounting plate, which attaches to the camera with a quick-release mechanism. Refer to Figure 3-4 for the method of attachment of the mounting plate. Use of the HARRIS TC-90 COLOR CAMERA in conjunction with a field tripod is often desirable when the camera operator must wait for a long period of time for an event or for the appearance of a subject. When the "shoot" starts, the camera may be easily unlatched from the mounting plate and held on the shoulder.

3-11. Refer to Figure 3-5 for the most conventient method of holding the camera on the shoulder.

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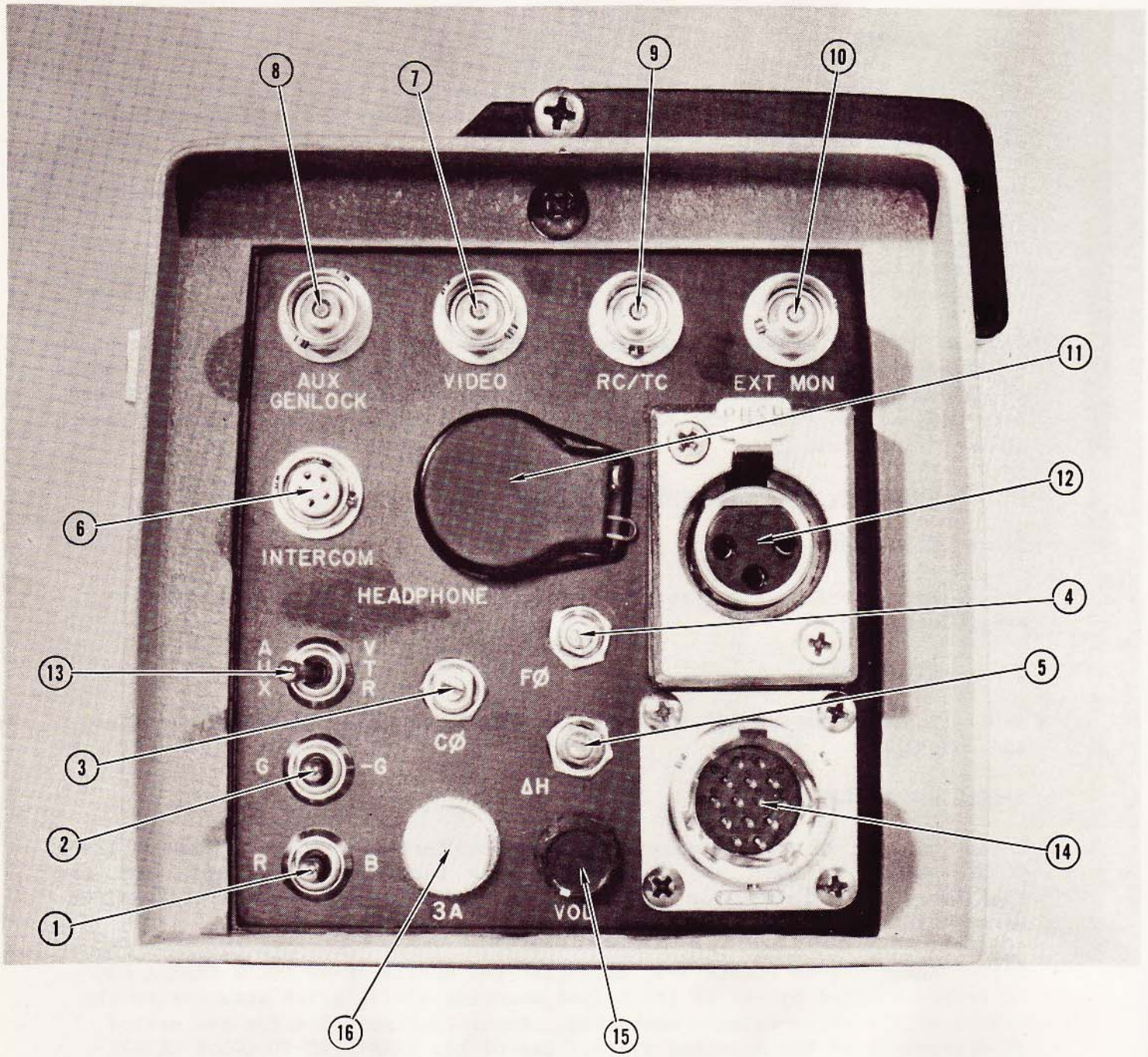


Figure 3-1. Rear Panel Controls, Switches, and Connectors

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Table 3-1. Rear Panel Controls, Switches, and Connectors

REF.	CONTROL/INDICATOR	FUNCTION
1	R/OFF/B (VF Switch)	Sums either red or blue video to the viewfinder input with center off position.
2	G/OFF/-G (VF Switch)	Sums either green or negative green video to the viewfinder input with center off position.
3	CØ (COARSE PHASE) (Rotary Switch)	Selects approximate phase of subcarrier for gen-lock operation.
4	FØ (FINE PHASE) (Control)	Adjusts subcarrier to precise setting for gen-lock operation.
5	△(H timing) (Control)	Adjusts horizontal sync timing for gen-lock operation.
6	INTERCOM LINE OUT (Connector)	Provides connection to external intercom system for EFP use.
7	VID OUT (Connector)	Composite color video output of camera for connection to CRT, VTR, microwave, or other terminal.
8	GEN LOCK (Connector)	Input for composite video or color black signal to which camera is to be gen-locked.(Also EXT VF input.)
9	REM CONTL IN (Connector)	Input for digital remote control feed from EFP camera control system.
10	EXT MON (Connector)	Output from viewfinder video switcher to drive optional external monitor.
11	HEADPHONE (Connector)	Connection for cameraman's headphone when using external intercom system.
12	PRGM MIC (Connector)	Connection for on-board program microphone. Amplified program audio is fed to the VTR interconnect.

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Table 3-1. Rear Panel Controls, Switches, and Connectors (Cont'd)

REF.	CONTROL/INDICATOR	FUNCTION
13	AUX/VTR (Switch)	Selects the external viewfinder feed which is displayed when Y/RGB/EXT switch(front panel) is in the 'EXT' position.Selects between the Genlock or VTR playback inputs.
14	VTR (Connector)	VTR cable interconnect. Feeds camera video, program audio and VTR control to VTR. Connects return video from VTR to viewfinder and various status signals from VTR to LED's in viewfinder. Connects VTR battery power for optional use by camera.
15	VOL (Control)	Controls headphone volume of cameraman's headphone when using external intercom system.
16	FUSE, 3A	Main dc fuse for camera power supply. Littlefuse 272003 HARRIS part no. 398-0430-000

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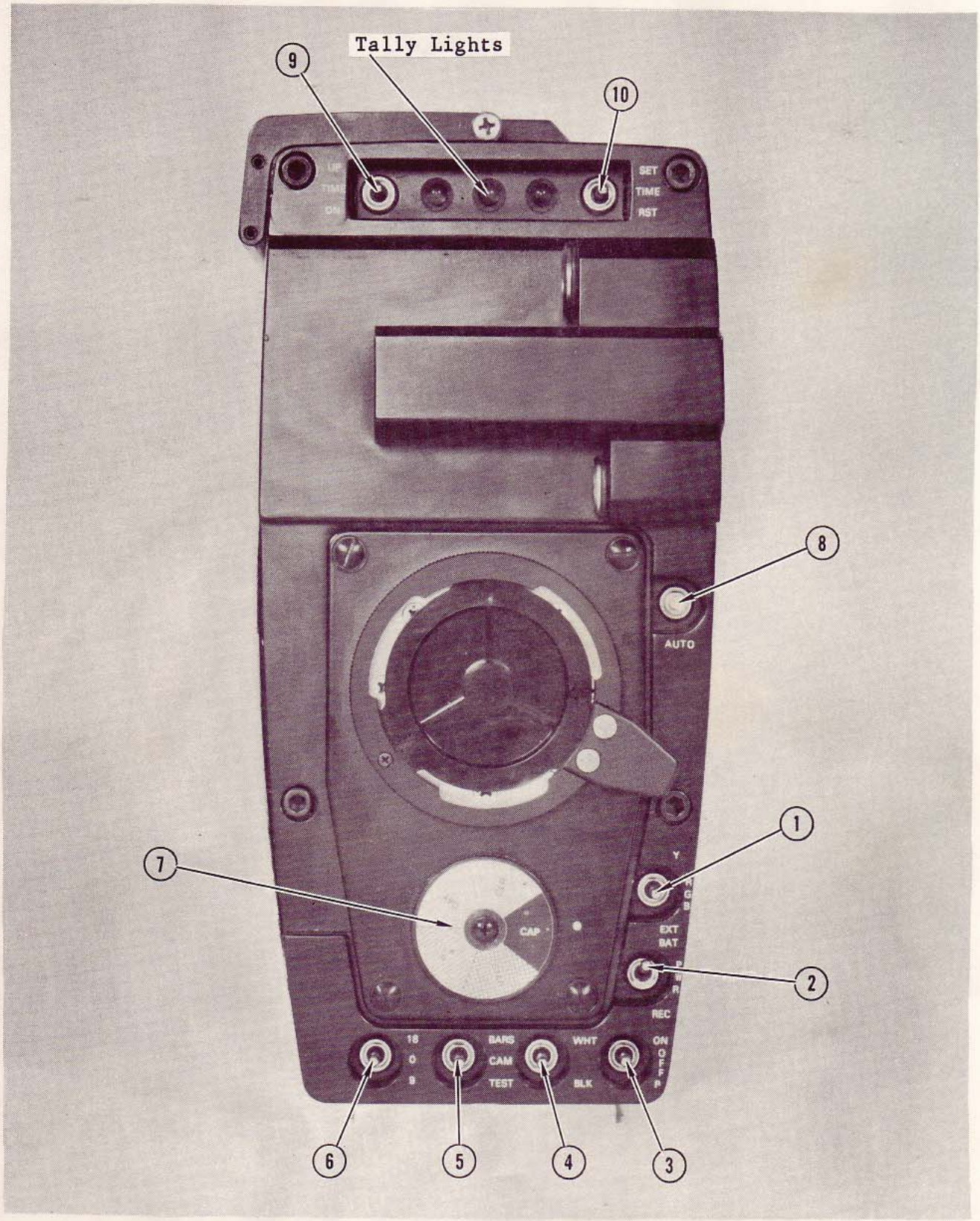


Figure 3-2. Front Panel Controls, Switches, and Connectors

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Table 3-2. Front Panel Controls, Switches, and Connectors

REF.	CONTROL/INDICATOR	FUNCTION
1	Y/RGB/EXT (VF Switch)	Connects Y (luminance), enables selection of RGB signals or EXTernal video to the viewfinder input.
2	BAT/REC (Power Switch)	Connects the camera to operate from either the on-board battery pack or the VTR battery.
3	ON/OFF/SB (Power Switch)	Camera ON-OFF switch with a standby position. In OFF position the camera is totally off. In the Standby position, only the camera pickup tube heaters are on to eliminate warm-up time delay while minimizing power consumption.
4	WHT/BLK (Auto Switch)	Actuates automatic, white or black, color balance.
5	BARS/CAM/TEST (Select Switch)	Selects color bars, camera video or a stairstep calibration waveform at the VID OUT connector.
6	18/0/9 (Gain Switch)	Selects normal video gain (0 db), +9 dB or +18 dB to accomodate normal, low or very low scene light levels.
7	CAP/CLR/DAY/+0.8/ STAR Filter Wheel	Selects appropriate filter in optical path. CAP - Manual lens cap CLR - For studio lighting(~3200°K) DAY - For cloudy day outdoors(~8200°K) +0.8 - For Sunny day outdoors(~8200°K) STAR - For star filter effect in the studio(~3200°K)
8	AUTO (Switch)	Operates SMART PACKAGE OPTION. Refer to T.M. No. 888-6000-001.
9	TIME, UP/DN (Switch)	
10	TIME, SET/RESET (Switch)	

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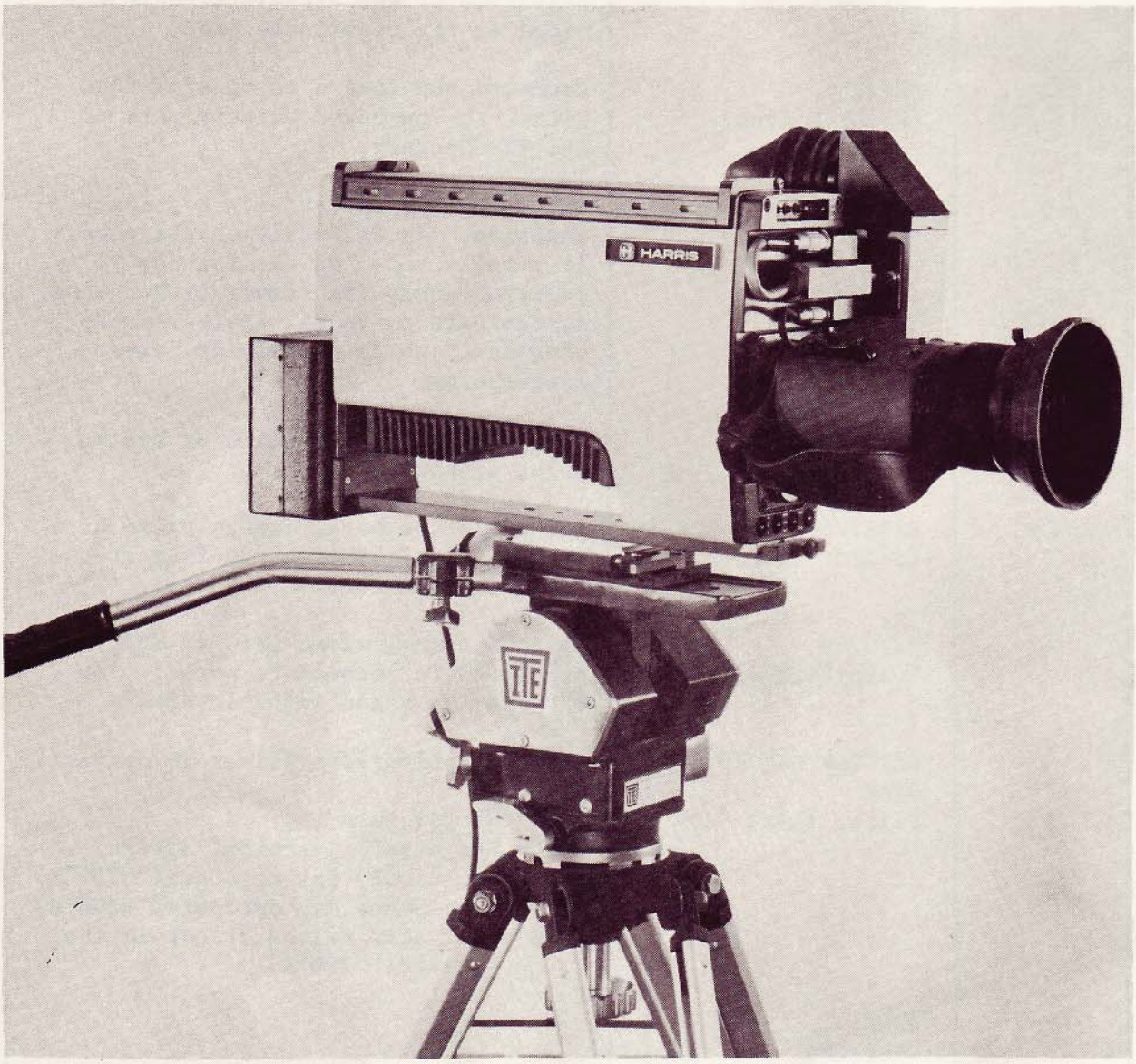


Figure 3-3.

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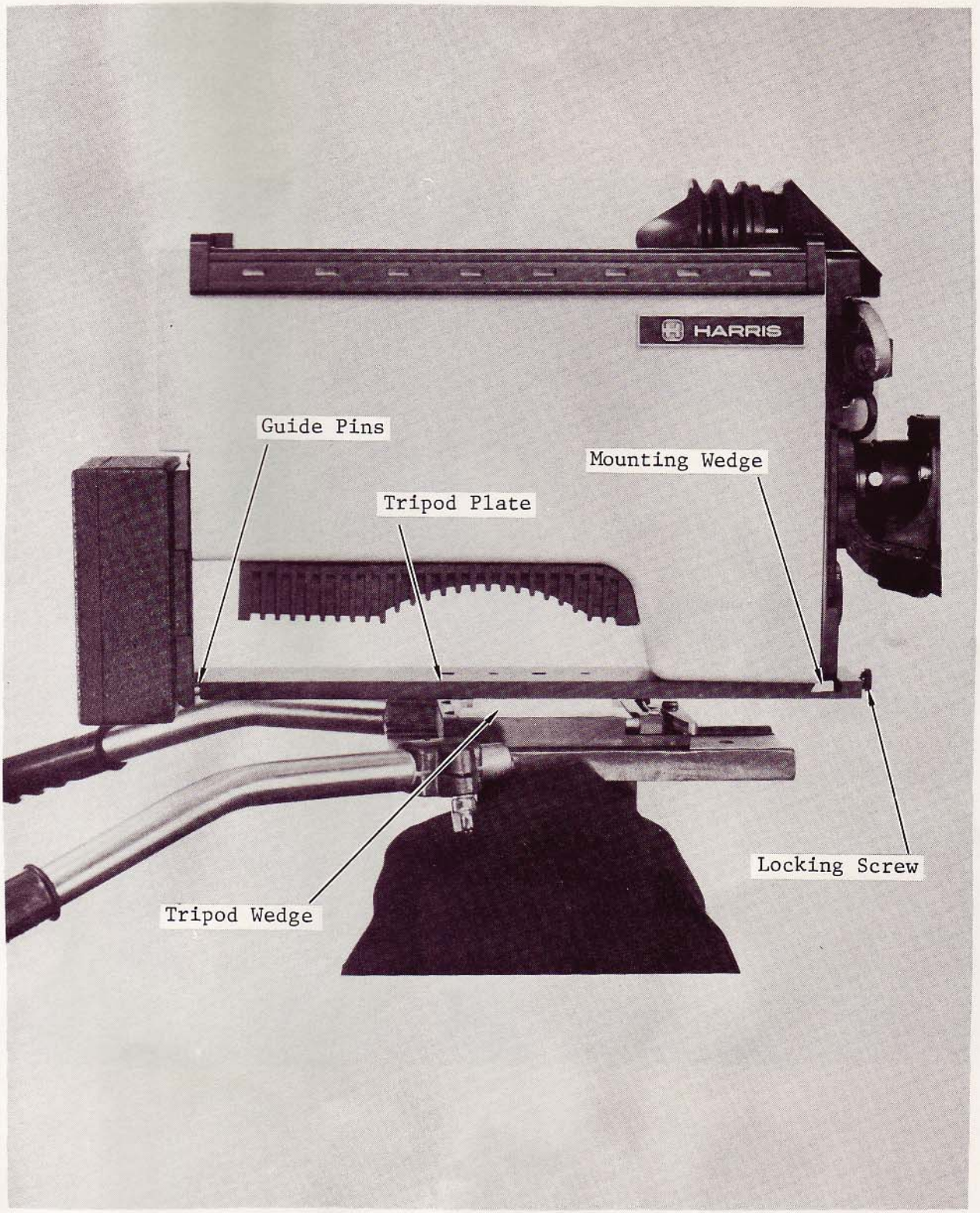


Figure 3-4.

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Figure 3-5.

WARNING: Disconnect primary power prior to servicing.

3-12. A program microphone amplifier is built into the HARRIS TC-90 COLOR CAMERA. When a microphone is plugged into the PRGM MIC connector, at the rear panel, the audio output of this amplifier is fed through the VTR/VCR cable to the audio input of the VTR or VCR.

3-13. A selection of lenses with various zoom ratios is available for use with the HARRIS TC-90 COLOR CAMERA. These lenses are manufactured by Angenieux, Canon, Fujinon, or Schneider. Note that these lenses must be designed to interface mechanically and electrically with the HARRIS TC-90 COLOR CAMERA.

3-14. The on-board battery pack is a 2-ampere-hour or a 4-ampere-hour unit equipped with mechanical and electrical interfaces to mate with the Camera.

3-15. The 2-ampere-hour battery , if fully charged, will operate the camera for approximately one hour at about 25°C.

3-16. The 4-ampere-hour battery, if fully charged, will operate the camera for approximately two hours at about 25°C.

3-17. Suitable batteries may be obtained from HARRIS Broadcast Division.

3-18. To recharge the batteries, either a trickle charger or a fast-charge battery station must be used. These are listed in Table 3-3.

3-19. When using the HARRIS TC-90 COLOR CAMERA with a portable VTR or VCR it is important to use the proper interconnecting cable between the camera and VTR/VCR.

3-20. It is possible to operate the camera from the on-board battery or from the VTR/VCR battery. This selection is made on the camera front panel with the switch labelled POWER, BAT/REC.

3-21. When it is desired to operate the camera in the power saving STANDBY mode, select the SB position of the front panel switch labelled ON/OFF/SB. In this mode the tube heaters are on, but the internal power supply is off. Instant operation may be selected by switching from the SB position to the ON position.

3-22. For low-light level operation, a front panel switch allows selection of either +9 dB or +18 dB of added video gain. In these positions, the signal-to-noise ratio of the camera will be degraded.

3-23. The BARS/CAM/TEST switch, on the front panel, is used to select color bars for setting video levels into the VTR/VCR or normal camera output. The TEST position injects a stair-step signal into the red, green, and blue channels to facilitate camera setup or troubleshooting.

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3-24. The WHT/BLK switch is used for initiating, white or black, color balance as described in paragraph 2-39. Once these settings have been made, an internal battery keeps a memory alive for the life i of the internal memory back-up battery(typically 1 year), even if the camera is switched off. A new white balance procedure should be accomplished whenever the scene lighting changes. For example, when changing from indoor lighting to outdoors or when changing from a midday sun to near sunset conditions.

3-25. The Y/RGB/EXT switch, on the front panel, should be used in the Y position. This selects the video to be viewed in the viewfinder. The Y position gives accurate tonal rendition of shades of gray. The RGB position enables selections of R, B, or G, -G at the rear panel.

3-26. To check camera registration, operate the Y/RGB/EXT switch, on the front panel, to the RGB position, select -G and either R or B at the rear panel with the appropriate switches. This gives a subtractive registration display. If a positive registration display is desired, select G and either R or B position. When registration checking is finished, operate the Y/RGB/EXT switch to the Y position for normal camera use.

NOTE

If the registration requires adjustment, refer to the registration adjustment procedure in the Maintenance Technical Manual.

3-27. There are four LED indicators on the viewfinder just above the picture display. These give a visible indication of the following:

a. REC — When illuminated, indicates the VTR/VCR is in the record mode.

b. TW — When illuminated, indicates end of tape, near end of tape, not locked or VTR not connected. Depends upon VTR/VCR used.

c. TB — When flashing or illuminated, indicates VTR/VCR battery is low. Depending on VTR/VCR used.

d. BAT — When flashing, indicates on-board camera battery is low.

SEE FIGURE 3-6

3-28. If the camera is to be used to feed a microwave, monitor, or other video equipment, a composite color signal output appears at the jack labelled VID OUT on the rear panel. This signal is available whether or not a VTR/VCR is connected though the 14-pin VTR connector.

3-29. Be certain to terminate the receiving end of the VID OUT cable with a 75-ohm load if this output is used.

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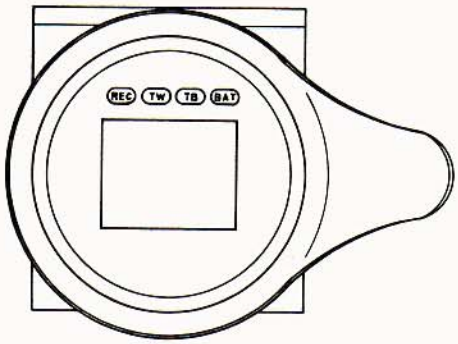


Figure 3-6.

NOTE

The HARRIS TC-90 COLOR CAMERA can drive a VTR/VCR and a monitor or microwave transmitter simultaneously.

3-30. The Viewfinder is equipped with two controls for adjustment of BRIGHTNESS and CONTRAST (Figure 3-7). When the CONTRAST knob is pulled out, a video peaker is switched ON and facilitates critical optical focussing of the zoom lens by emphasizing high-frequency video transitions.

3-31. An oscilloscope type display is available in the Viewfinder, superimposed on the picture at the right side, and indicates video level. The vertical line indicates 100 percent exposure. Brightness of display may be adjusted by removing plug on bottom of viewfinder case and adjusting potentiometer till desired brightness is acheived.

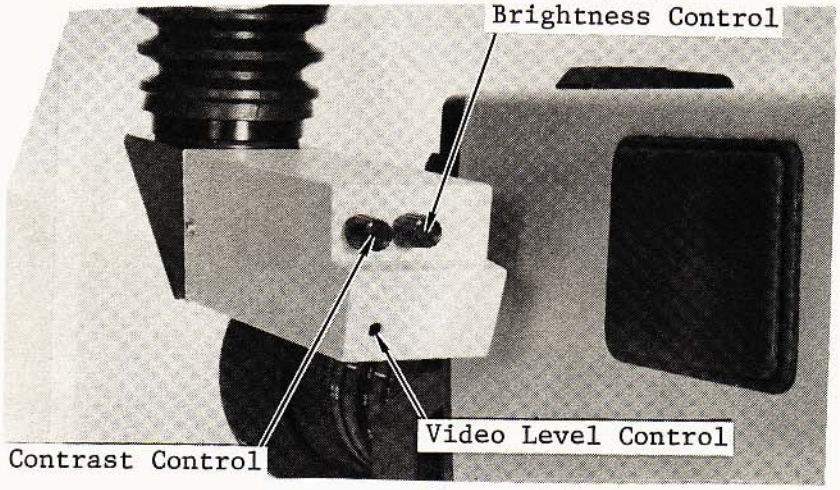


Figure 3-7

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3-32. The Viewfinder Switcher System allows for viewing of R, G, B, -G or EXT (EFP operation). Refer to Control, Switches, and Connectors, paragraph 3-5.

3-33. When the camera is used with a VTR/VCR, the camera video and the output of the built-in program microphone amplifier are fed through the 14 pin VTR connector to the recorder inputs.

3-34. When the recording is completed, it may be viewed in monochrome in the camera Viewfinder by :
Selecting 'VTR' position on the rear panel 'AUX/VTR' switch. This will cause VTR playback video via the VTR cable to show in the viewfinder.

3-35. ELECTRONIC FIELD PRODUCTION (EFP) OPERATION

3-36. Figure 3-8 illustrates the Electronic Field Production (EFP) system for the HARRIS TC-90 COLOR CAMERA COLOR CAMERA.

3-37. For EFP use, the lens is equipped with optional zoom and focus extension kits so that these functions may be controlled from the rear of the camera.

3-38. It is usually much more useful to use the optional 5-inch (diagonal) Viewfinder with the camera when in the EFP or studio mode. For economy, it is possible to use the ENG 1-1/2 inch Viewfinder.

3-39. For EFP operation, the camera may be powered from the optional ac power pack if it is convenient to find a source of ac power near the Camera Head.

3-40. When it is difficult or impossible to use ac power at the Camera Head, as in an outdoor situation, the Camera Head should be powered from either the 2-ampere-hour battery pack (1 hour) or the 4-ampere-hour battery pack (2 hours).

3-41. The optional remote control system for the HARRIS TC-90 COLOR CAMERA is used in the EFP configuration. This allows for remote control of the following camera functions from the Camera Control Unit (CCU):

a. Red Vertical Centering

b. Red Horizontal Centering

c. Blue Vertical Centering

d. Blue Horizontal Centering

e. Red Black Level (Paint)

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f. Blue Black Level (Paint)

g. Red White Level (Paint)

h. Blue White Level (Paint)

i. Master Black Level (Pedestal)

j. Iris

k. Cap/Manual Iris/Auto Iris

l. Paint/Normal

m. White Balance/Black Balance

n. +9dB/0dB/+18dB (Added Gain)

o. Bars/Camera/Test

p. Center Trim/Normal

q. Tally (Lamp)

r. Call (Sounds in camera intercom)

s. Intercom (two-way)

t. External Video Feed (To VF,must be synchronous with Genlock Source.)

u. Genlock (To TC-90)

3-42. These functions may be remoted up to 1000′ from the Camera Head through a length of RG-59/U 1/4" coaxial cable, or up to 5000′ from the Camera Head through a length of Belden 8281 coaxial cable. The remote control coaxial cable is attached to the REM CTRL IN connector at the Camera Head rear.

3-43. When using the remote control system, the camera video output must be routed to its destination on a separate length of coaxial cable attached to the VID OUT connector at the Camera Head rear.

3-44. When using a RG-59/U video cable longer than approximately 100 feet, for the TC-90′s output, a video equalizing amplifier should be used at the receiving end to compensate for cable losses. If lower loss cable such as 8281 is used, the video may be extended up to approximately 200 feet without requiring a video equalizing amplifier.

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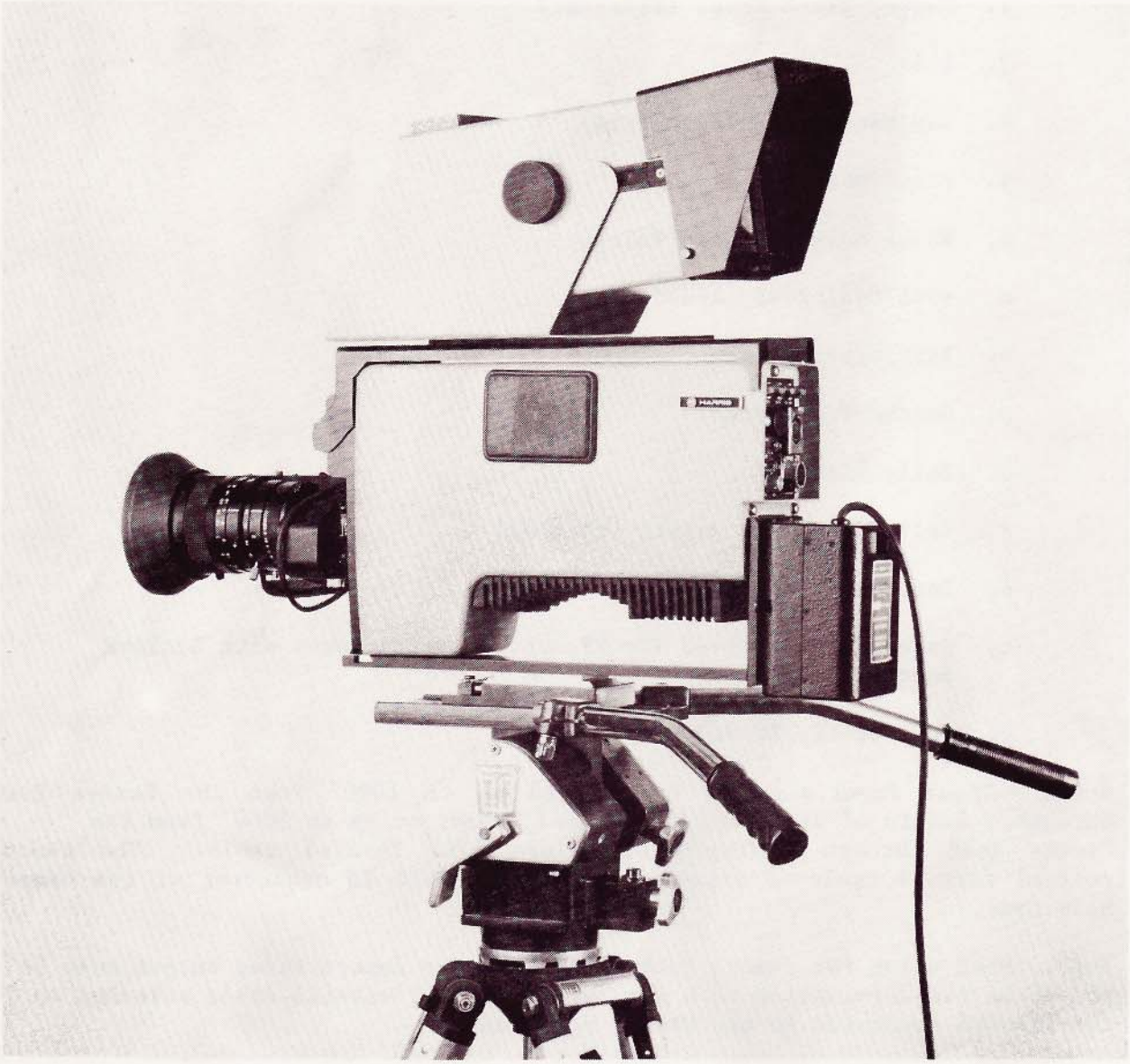


Figure 3-8.

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NOTE

Even at the lengths specified here, there will be some losses at higher frequencies. When the highest quality video is required, it is advisable to always use a video equalizing amplifier.

3-45. For details of installation and operation of the HARRIS TC-90 COLOR CAMERA remote control system, refer to the appropriate instruction manual.

3-46. GEN-LOCK TIMING AND PHASING

3-47. The two conditions under which it may be required to gen-lock are as follows:

a. Gen-locking to an external feed (ENG).

b. Gen-locking to an external feed (EFP) with remote control system.

Refer to Maintenance Manual 888-2121-001 for details of Gen-Lock adjustments.

3-48. VIDEOTAPE RECORDING

3-49. When the HARRIS TC-90 COLOR CAMERA is connected to a VTR or VCR, the 14 pin VTR plug at the Camera Head rear panel must be used.

3-50. Study the User Manual that applies to the VTR-VCR being used.

3-51. The four LED indicators in the 1-1/2 inch Viewfinder are used when recording. These are described in paragraph 3-27. Depending upon the VTR or VCR used, none, some, or all of them may be active.

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SECTION IV

MAINTENANCE

4-1 MAINTENANCE

4-2 After receipt of your camera, the memory back-up battery inside the camera case needs to be replaced on a yearly basis. See TC-90 MAINTENANCE MANUAL 888-2161-001 for details. The TC-90 does not require any other scheduled maintenance.

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SECTION V

TECHNICAL ASSISTANCE

5-1 TECHNICAL ASSISTANCE

5-2 HARRIS Technical and Troubleshooting assistance is available from HARRIS Field Service Department 24 hours a day. Telephone 217/222-8200 to contact the Field Service Department or address correspondence to Field Service Department, HARRIS CORPORATION, Broadcast Division, P.O. Box 4290, Quincy,IL. 62305-4290, USA. The HARRIS factory may also be contacted through a TWX facility (910-246-3312) or a TELEX service (40-4347).

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