BTS

Broadcast Television Systems GmbH

A joint company of Bosch and Philips

LDK 910
Frame Transfer-CCD
Production Camera System

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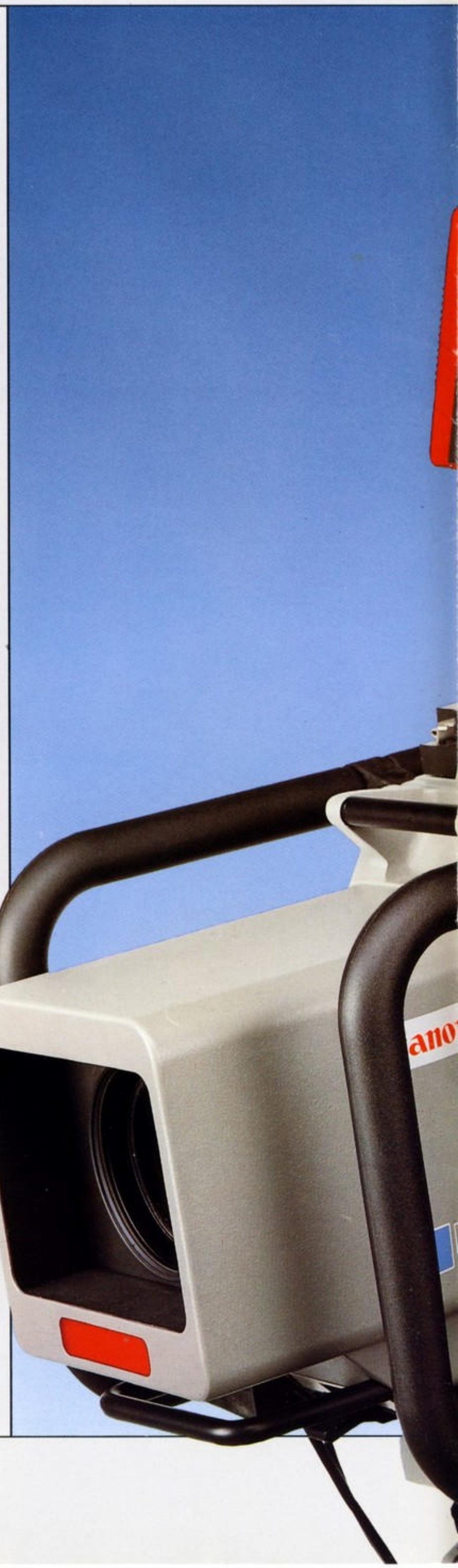
LDK 910 broadcast studio quality . . .



LDK 910 production camera with new FT-5 sensors exceeds TV system demands with no compromise in performance.

BTS, the inventors of smear free Frame Transfer sensor technology once more break the barriers of performance with the new high pixel density CCD. Over 20 years research and development experience has gone into producing a CCD sensor which matches and in many features exceeds tube performance and the demands of established television systems. These high resolution devices with over 800 pixels per line (NTSC) equating to 700 TVL of resolution, provide clean, quiet pictures of outstanding colour fidelity matching international standards. And the increase in sensitivity by almost one full stop, a new anti-flare coating and a film-like dynamic range provide total freedom of use in any television environment.

To match the performance of this unrivaled sensor, BTS have designed the optimum in processing circuitry with clean artifacts free performance to handle high level signals with film-like transient response.

The BTS LDK 910 production camera has ergonomic and feature-packed user facilities to meet the most demanding television situation. Designed with the help of world renowned cameramen, it is the hallmark of a user friendly production tool allowing total freedom for artistic expression.

. . . from BTS CCD-FT know-how

Instant Use

Ready when you are, the LDK 910 needs no warm-up, no maintenance and no technical setting up. Light-weight, sturdy and with all-round carrying handles, the LDK 910 is easily transported for studio or field use.

Unrivaled Picture Quality

BTS LDK 910 camera with new sensors using Frame Transfer technology provides clean, high colour fidelity pictures exceeding established system standards. High pixel density sensors with over 700 TVL of resolution equals or out-performs tube cameras with no smear.

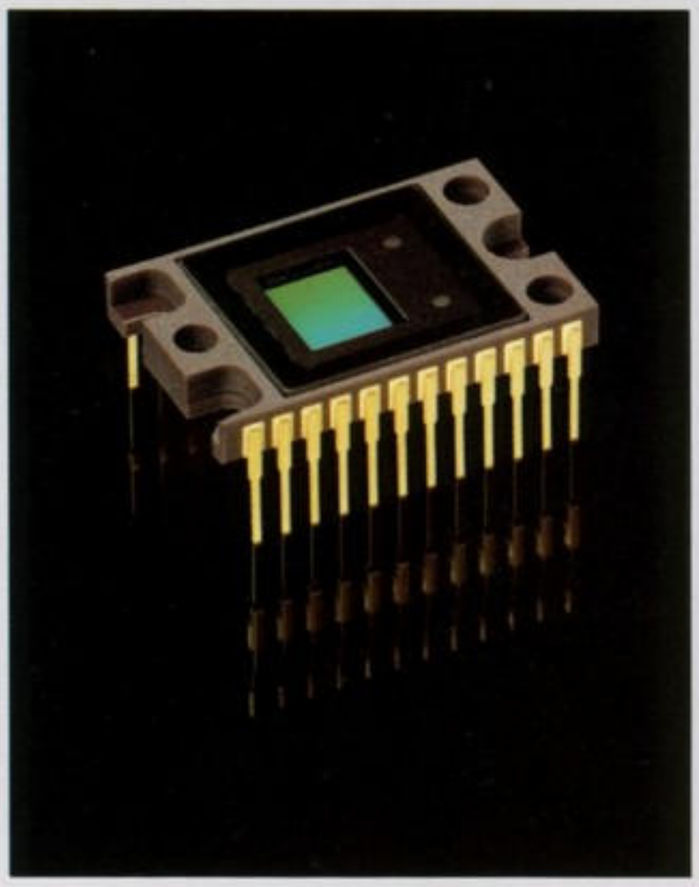
Maintenance free economy

There are no routine replacements with the BTS LDK 910. Tube changing is a thing of the past eliminating a major inventory expense in your annual budget. And under the most rigorous working conditions, the LDK 910 will be reliable in the extreme throughout its lifetime. Even the built-in shutter is maintenance free and that's been proven in over 2000 BTS CCD broad-cast camera products.

Operational Flexibility

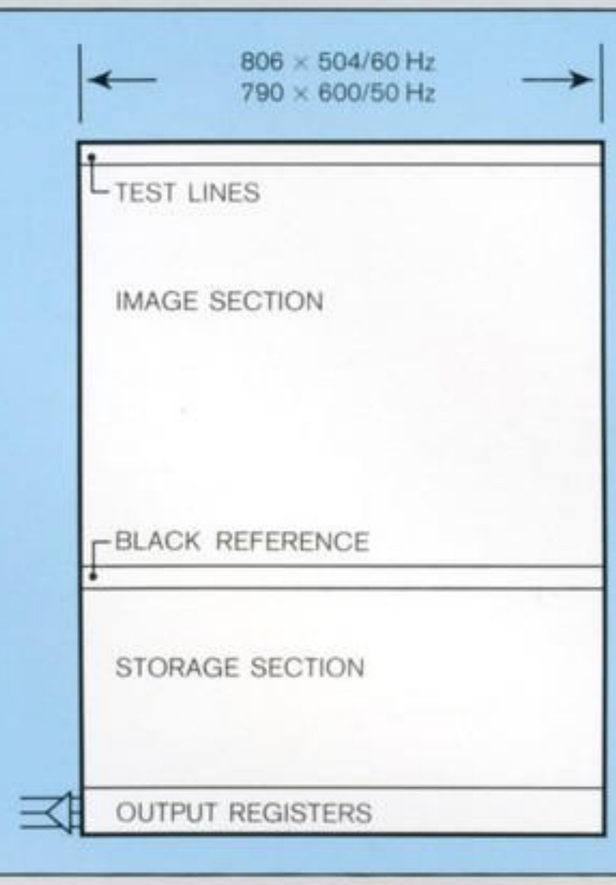
Whatever your production camera needs, BTS can supply the ideal solution. For Studio or field use and with lenses up to 55 times zoom range, the LDK 910 production camera will provide a complete answer. And it has a complete range of production facilities including two external video inputs and telepromter input, extended intercom facilities, utility power outlet and a Hi-Fi audio channel. In stand-alone mode there is also an SMPTE/EBU connector for direct taping from the camera head.

LDK 910 with FT-5 CCD sensors . . .



The CCD-FT principle

The FT-5 sensor has a photo sensitive area with 474,000 pixels (50 Hz) and 406,000 pixels (60 Hz). The Frame Transfer CCD with shutter completely eliminates smear. Each separate image is transferred to storage before a new image takes it's place. The shutter is timed to operate during this transfer and it interupts exposure during the frame shift. Each frame of the picture is therefore clean and independent of the previous frames and highlights with no smear effects possible.



Frame Transfer CCD – experience counts

BTS, with over 20 years of experience in research and development of Frame Transfer CCD technology, now provides broadcasters with a high performance sensor, the FT-5, in a camera which rivals or out-performs equivalent tube based products, the LDK 910. Only with BTS Frame transfer sensors is the basic problem of smear eliminated. And the high pixel density new sensor has permanent and accurate geometry and registration, with no lag, no comet tails and no burn-in.

The BTS research and development program, maintaining on-going support for it's products in daily use, has provided the LDK 910 with high technology processing circuits to realize the full potential of the new sensor. Clean processed video signals, free of spurious artifacts, and with a film-like transient response, optimize the sensor performance which in the absence of tube defects provides total broadcast quality in both studio and field environments. With over 60 years of broadcasting experience, longer than any other company in the world, BTS has once more provided a product at the leading edge of technology – the LDK 910 Frame Transfer CCD production camera.

The FT-5 sensor

During 20 years of research and development of CCD devices, a conclusion was reached that only the frame transfer principle had the potential to provide the quality of performance, suitable for broadcast use, being totally free from smear effects. Further advantages such as an image section not cluttered with image gates and overflow drains in the light path, enabled Philips to pack a large number of sensor elements onto a very small area with no large gaps between them to accommodate non-sensor elements which contribute to aliasing effects. This unique and important technology resulted in a high sensitivity, high resolution CCD chip of only one half inch in size. With such miniaturization, the corresponding camera prism optics could be small and light resulting in a low weight, and compact camera design. The new FT-5 sensor based on the same unique technology has the benefit of all this inhouse experience. The result is a higher pixel density, over 800 pixels per line in NTSC, improved sensitivity and considerably reduced flare. In the LDK 910 these high performance sensors enable genuine broadcast quality to be achieved.

Advantages of BTS Frame Transfer CCD sensors

As well as the now familiar advantages of CCD sensors, accurate and permanent geometry and registration, no aging, lag, burn-in or blooming, the BTS LDK 910 with new Frame Transfer sensors offers additional benefits. With the frame transfer principle and it's attendant shutter there can be no smear to impair broadcast quality under any conditions. There is a shorter exposure time (integration time), resulting in higher dynamic resolution important when shooting fast moving objects for slow motion replay. This very high resolution sensor is possible because only sensor elements are in the light path allowing larger pixels to be used. And, with relatively larger sensor elements, absolute manufacturing tolerances, common to all CCD designs, are reduced. This culminates in a reduction in dark current which reduces fixed pattern noise and provides clean pictures even at high camera gain settings.

. . . equals or betters tube performance

LDK 910 unequaled Features

The BTS LDK 910, has many features derived from the successful LDK 900. The ergonomic design, developed with the help of world acclaimed camera-men, includes a very low optical axis and centre of gravity making the camera easy to use. And with it's integral wedge plate, camera/lens combinations, with up to 55 times zoom range, can be quickly and easily balanced on the tripod or pedestal. The allround carrying handles on the light-weight camera head, facilitate quick and easy transportation and rigging in any studio or field situation.

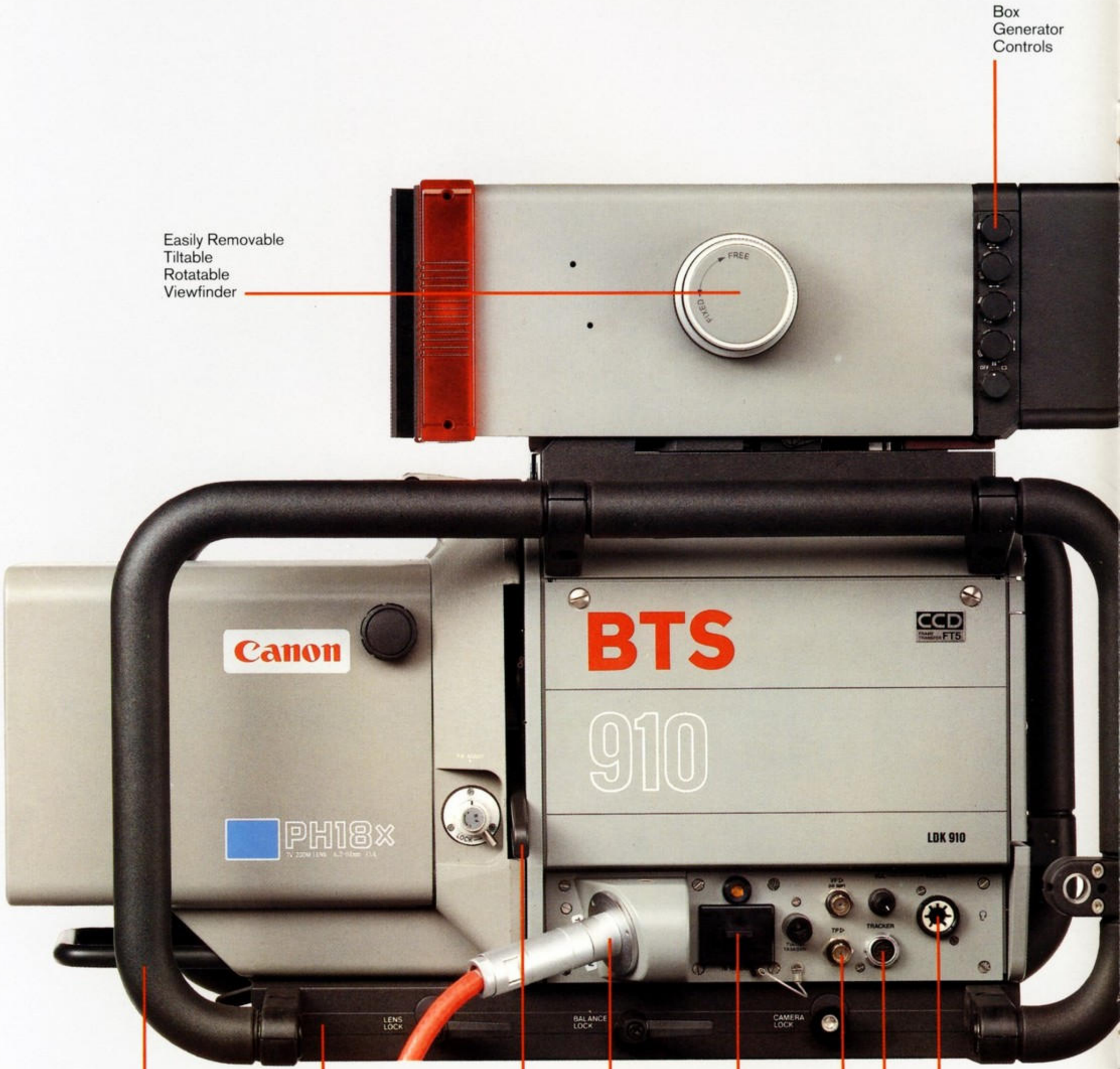
With electronic colour temperature compensation covering all lighting situations from daylight to studio lighting, colour conversion filters are not necessary. In daylight colour temperatures this results in one more F-Stop of sensitivity. A choice of 4, easily selectable gain positions cover all eventualities from high light levels, where – 6 dB may be selected giving extremely high signal to noise performance, to + 12 dB for extreme low light operation.

In fast action sport, the electronic exposure control can provide clearer pictures for slo-mo or stop motion replay from VTR's. The maximum value of 1/500 is chosen as an optimum compromise between speed of action, the needs of the operator and sensitivity loss. In all cameras, very short expo-sure times cause a corresponding loss of sensitivity and in some cameras, using very short exposures, this loss may result in wide open lenses even in good lighting, with consequent very small depth of focus and maximum lens distortions, a serious problem for broadcast usage.

Feature Packed Viewfinder

The LDK 910 viewfinder has all the features, and more, required for a studio type production camera. It has a 7 inch (17 cm) display tube of very high brightness and resolution. It features an electronic safe area indication and a character display indicating F-Stop, auto white balance and colour tempera-ture setting. And with diagnostic messages displayed in clear simple terms the cameraman is always well informed. The sturdy mechanical design allows for a plus and minus 50 degrees of tilt and plus and minus 100 degrees of rotation and it's very easy to exchange and service. With a range of studio and sun hoods this viewfinder will perform well in any television situation.

LDK 910 so compact and light . . .



. . . and packed with features

LDK 910 reliable and versatile . . .

LDK 910 on location

Rugged, reliable and rain proof the LDK 910 is able to work over a wide range of environmental conditions and temperatures. It is ideal for outside broadcast use being so small and compact and yet so rugged.

It can be used alone with a suitable VTR and local control panel or be used in a multiple camera situation with the LDK 91 portable companion.

For remote operation, up to 2000 meters (6560 feet) of economic light-weight triax cable is connected to the compact Base Station with it's associated professional Operational Control Panel. Composite and component outputs are available as well as full bandwidth RGB for chroma keying. And the highest broadcast performance can be maintained at maximum cable lengths.

For single camera operation the LDK 910 camera head can be used in a stand alone mode with local powering and may be connected directly to a suitable VTR.

The LDK 910 is fully compatible with the lightweight multirole portable camera, the LDK 91 and the LDK 90 and LDK 900 series cameras, providing flexible and economic operation for new and existing users.

LDK 910 companion

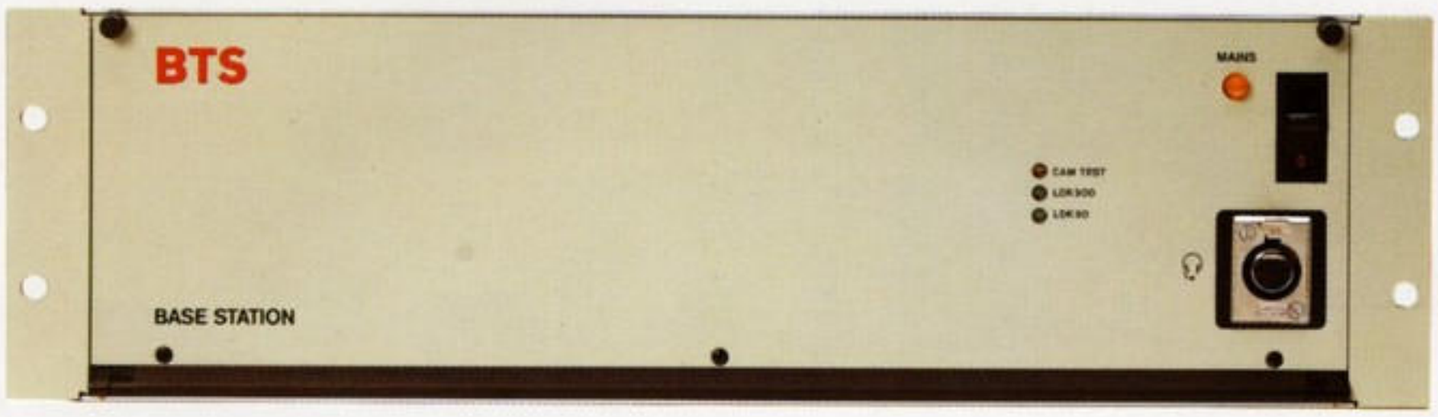
The triax EFP version of the LDK 91 is an ideal and fully compatible companion for the LDK 910 studio camera. They have the same full broadcast picture quality, using the new FT-5 sensor and high performance processing circuits and very accurate color matching with whatever combi-nation of cameras are used. This same compatibility also extends to the LDK 90/900 series cameras and allows existing and new customers to mix camera types in any combination, and still have complete matching in facilities and colorimetry.

Triax – reliable and economic

The triax Base Station together with the Operational Control Panel are also common to both camera systems pro-viding a fully integrated and user friendly system suitable for studio or outside broadcast use.

Together, this powerful combination of portable and studio CCD cameras provides an economic and perfectly matched system to suit all television applications.

. . . yet so economic



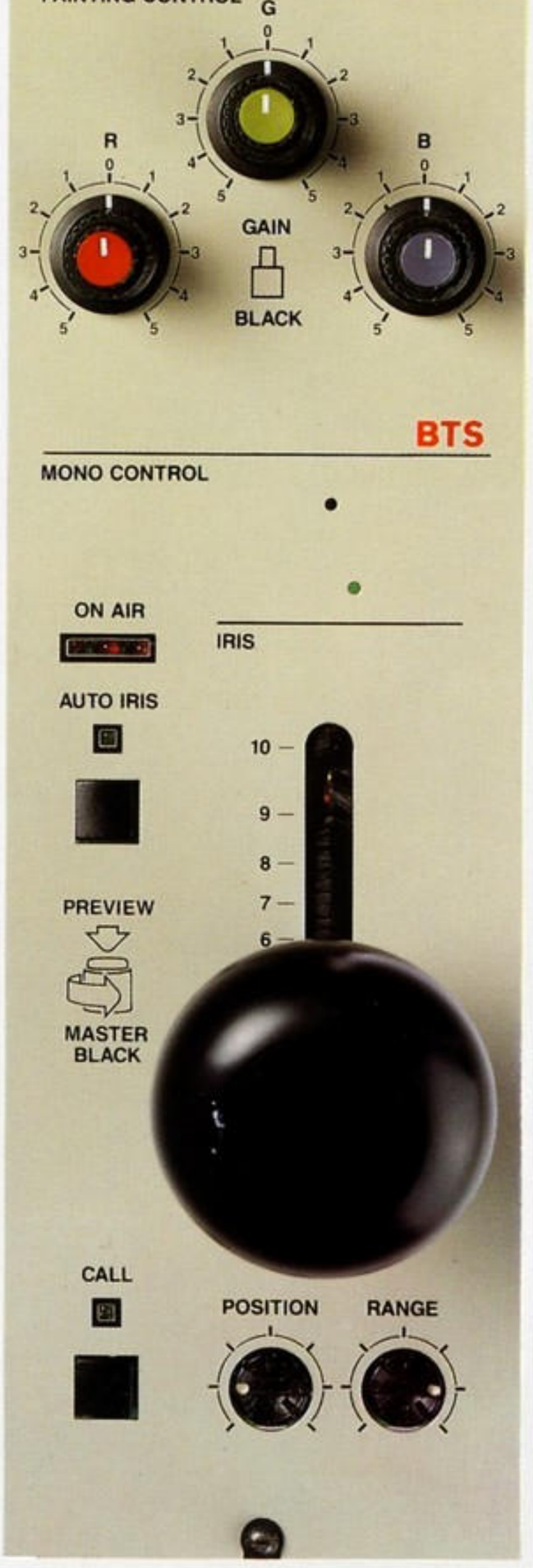
Base station

The Base Station is a compact unit, 19 inches wide and 3 rack units high. It has outputs of full bandwidth RGB as well as composite and component signals. Among the many other inputs and outputs are included a sync input reference, two external viewfinder inputs, a teleprompter input and program audio. A high quality audio output from the camera microphone channel is also provided. The 2 or 4 wire communications system is very comprehensive and allows for extensive talkback to the cameraman, floor manager, boom operator, production and engineering.

There is a monitoring output, controlled from the Operational Control Panel, for a picture and a waveform monitor. The Base Station can be located up to 2000 meters, 6560 feet, from the LDK 910 camera head, with lightweight and economic triax cable.

Operational Control Panel

The professional Operational Control Panel is a single unit, 80 mm wide (3.15 inches) and 320 mm long (12.16 inches). It has all the functional controls for the camera channel including mono-knob control of iris and master black level, individual RGB painting controls, color temperature selection, gamma controls, knee function, variable contours and black stretch on-off. There are also controls for exposure setting, white balance memories and auto white balance, color bar on-off and extensive waveform and picture monitoring. The OCP may be connected to the Base Station by a standard 10 meter cable or if required up to 350 meters of lightweight cable.



Local Control Panel

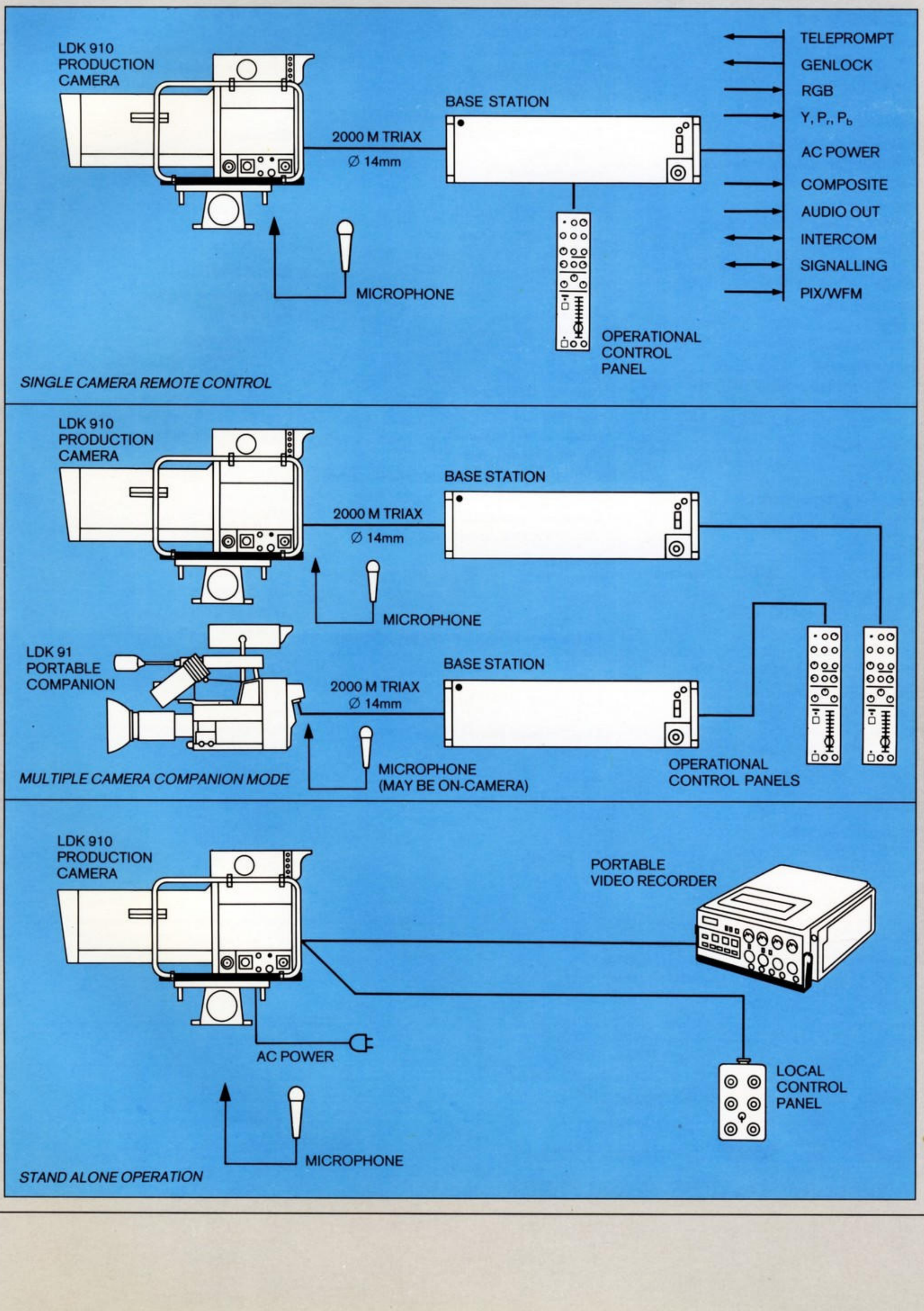
For LDK 910 stand alone mode, the small and compact Local Control Panel provides a simple and economic means of adjusting the camera. It allows for control of iris and auto iris, master black, and individual red and blue painting.

LDK 910 support and service . . .

BTS support and services

With 60 years of experience in the industry, BTS can claim to have been longer in the world of television broadcasting then any other company. For our customers, this equates to a knowledge of their needs in support and service activities as well as products. It also means a long and on-going continuity of support, reliably available, all over the world. Our very substantial commitment to research and development of a complete range of broadcast products and services, backed by our parent companies, Bosch and Philips, provides a solid guarantee to our customers, of our continued and cooperative support for their needs.

. . . for all systems



Technical Data

Camera Head

Transmission system
PAL or NTSC

Power supply
220 – 240 V
110 – 120 V 47 – 63 Hz

Power consumption
170 W including lens, viewfinder and 70 VA utility output

Pick-up device
3 Philips Frame Transfer CCD's

Picture elements	Total Pixels
790 (h) × 600 (v) PAL	474.000
806 (h) × 504 (v) NTSC	406.000

Optical system
4 position filter wheel
F 1.4 prism with quartz filter

Inputs signals
Play back video signal at VTR connector
Composite or Black burst
External 1, External 2, Teleprompter

Output signals
Composite output at Camera head and VTR connector
Sync y at VTR connector
Components (Y, P_r, P_b) at VTR connector
Viewfinder signal
Colour bars (Full field, EBU white level)

Sensitivity
1750 Lux (156 ft. cd.) NTSC
2000 Lux (176 ft. cd.) PAL
at F4.0 with 90 % reflectance. Optically equivalent to F5.6 in 2/3 inch format.

Limiting Sensitivity
13 Lux (1.2 ft. cd.) NTSC
15 Lux (1.3 ft. cd.) PAL
at F1.4 and highest gain (++)

Signal to Noise Ratio
61 dB NTSC, 60 dB PAL at normal gain.
At low gain: + 3 dB extra.

Horizontal Resolution
> 700 TV lines
> 50 % modulation depth at 5 MHz

Registration
Less than 25 nS (0.05 %) in all three zones without lens

Contour correction
Edge of band and out of band, contours from Red and Green

Geometric distortion
Negligible

Gain Control
– 3 dB, 0 dB, + 9 dB, + 18 dB
(+ 24 dB on request)

Colour temperature
Electronic presets for Studio (3200 K) and for daylight (5600 K)
7500 K available on OCP

White balance
Two selectable memories for auto white balance

Exposure control
Down to 1/500 sec.

Lighting Control
Nominal; 50 Hz; 60 Hz

Gamma correction
0.45 or 0.55 pre select via Switch panel or remoted to OCP

Contour correction
Variable levels via remoted OCP

Black level
0 %; – 10 %; – 20 % pre select via Switch panel

Black stretch
ON/OFF via Switch panel or remoted to OCP

Intercom
From base station to camera head;
1 channel
From camera head to base station;
1 channel

Audio
One channel from camera head to base station

Cable lengths
with ∅ 8 mm triax cable 675 m (2215 ft)
with ∅ 11 mm triax cable 1200 m (3940 ft)
with ∅ 14 mm triax cable 2000 m (6560 ft)
with ∅ 16 mm triax cable 2400 m (7875 ft)
(on request)

Dimensions
Camera head including bottom plate
length: 260 mm (10.2″)
width: 240 mm (9.5″)
height: 300 mm (11.8″)
weight: < 18 kg (< 40 lb)

Base Station

Transmission system
PAL or NTSC

Power supply
220 – 240 V
110 – 120 V 47 – 63 Hz

Power consumption
Approx. 280 W including camera, lens, viewfinder and utility

Input signals
External 1, External 2,
Teleprompter
Video reference

Output signals
Composite
R, G, B
Components (Y, P_r, P_b)

Ambient temperature
Operating: 0°C to + 45°C
Non operating: – 25°C to + 70°C

Intercom Inputs/Outputs
Production
Engineering
Programme
2 or 4 wire system

Dimensions
width: 482 mm (19.0″)
height: 132 mm (5.2″)
depth: 482 mm (19.0″)
weight: < 25 kg (< 56 lb)

Sachnummer 0 981 100 018 Modifactions Reserved

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8.90-4 (dr) VMK-W Printed in the Fed. Rep. of Germany