BTS

Broadcast Television Systems GmbH

A joint company of Bosch and Philips

LDK 900
Frame Transfer-CCD
Production Camera System

LDK 900 – a great innovation . . .

LDK 900 – a production camera system with state-of-the-art FT-CCD technology and optimised ergonomics for high performance and versatility with economy

Following the worldwide success of the LDK 90 portable multi-role camera system, BTS has produced the first production camera system with high resolution Frame Transfer-CCDs. It is the smallest and lightest full facility production camera in the world. It is very rugged and reliable. It includes the latest operational facilities. It can be used on its own, in conjunction with the perfect portable – the LDK 90 – or as part of a multi-camera system.

Its ergonomics incorporate the recommendations from experienced cameramen throughout the world.

The LDK 900 production camera can therefore be expected to out-perform any other camera in its class – for picture quality, for ease-of-use, for reliability and for economy.

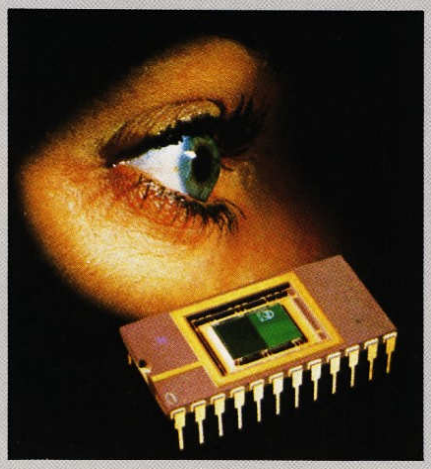
. . . with proven technology

A summary of benefits

The LDK 900 is the smallest and lightest full facility production camera in the world. Here is a short summary of its many great advantages.

- **Superb picture quality** with proven CCD-FT sensors
- **Reliability** with solid state electronics and no deterioration of picture quality through ageing
- **Maintenance-free** with rugged and rainproof case, solid state sensors, sealed-in shutter
- **Menu control** with personalised settings for stand alone operation
- **Microprocessor control** of important functions
- **Electronic shutter exposure** control for blur-free slow motion and freeze-frame recording
- **Triax cable** extends operations up to 2000 metres from the Base Station
- **Portable companion** – the successful LDK 90 with the same CCD-FTs for matching colorimetry
- **Ergononomically designed** by cameramen for cameramen
- **Production camera facilities** including:
  - both studio and field lenses up to 50 times zoom range
  - 7″ high performance viewfinder
  - two external video inputs
  - extended intercom facilities
  - utility power outlet (70 VA)
  - Hi-Fi audio channel
  - SMPTE/EBU VTR connector for stand alone operation
  - Teleprompter channel
- **Minimum cost of ownership** – with everlasting frame transfer CCD sensors, no maintenance cost and economic triax cable.
- **Uniform resolution corner to corner.** Microprocessor controlled automatic black level, with black reference built into the CCD itself.

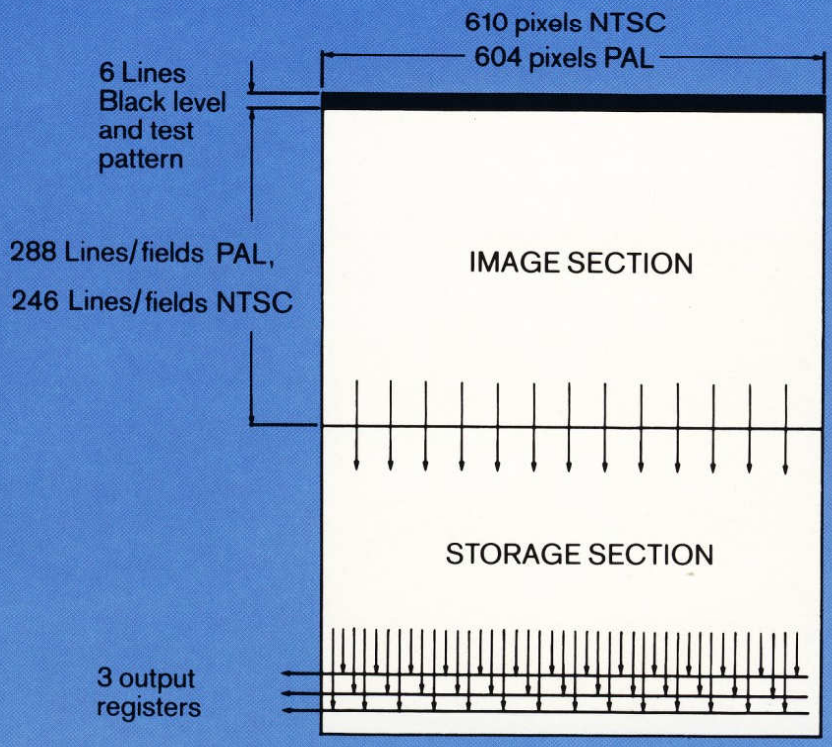
LDK 900 with CCD FT sensors . . .



CCD cameras – naturally better

The LDK 900 Frame-Transfer CCDs incorporate all the well known advantages of solid state sensors:

- Accurate permanent registration
- Perfect geometry
- No burn-in
- No blooming
- No lag
- No ageing
- No influence from (earth) magnetic fields on registration
- Temperature stability
- No microphonics in picture
- Everlasting sensors
- Less power consumption
- Uniform resolution corner to corner



The CCD-FT principle

The Frame Transfer structure has a photosensitive imaging section with 350,000 pixels PAL, 300,000 pixels NTSC located next to a storage region and connected to it by parallel shift registers.

Each separate image is transferred to storage before a completely new image takes its place. The shutter is timed to operate during the transfer to ensure that the image remains unchanged and unaffected by incoming light. Each field of the picture is thus clean and independent of previous fields and highlights (no smear).

Frame Transfer CCDs – extra excellence

The LDK 900 production camera with its Frame Transfer-CCDs and shutter offers these additional advantages over other CCDs:

- Higher resolution obtained by 604 (PAL), 610 (NTSC) pixels
- Total elimination of smear thanks to the CCD/shutter combination.
- Shorter picture exposure time of 1/50 second (50 Hz) or 1/60 (60 Hz) rather than 1/25 and 1/30 second respectively. These shorter exposure (integration) times result in higher dynamic resolution. This combined with an electronic shutter gives blur-free shooting of fast action which enables clear slow motion and freeze frame.
- Significantly improved vertical resolution compared with tube cameras.
- Considerable reduction in moire caused by aliasing

Special operational features

Many special operational features are incorporated into the LDK 900 to facilitate excellent results with ease-of-use whatever the conditions.

Dynamic Contrast Control handles in excess of 500 per cent signal level over peak white without loss of detail.

There are three electronic colour temperature pre-sets for studio and daylight use.

There are two auto white balance memories with a very wide range.

There is a choice of four gain control positions to suit different applications. In good lighting

conditions the unique low gain position gives an extremely high signal-to-noise ratio (plus 6 dB) in operational conditions.

The gain control positions are:

− 6 dB	for applications where an extremely high (+ 6 dB) signal/noise ratio is required.
0 dB	for normal operation
+ 6 dB	for low light level operation
+12 dB	for extreme low light operation.

A motor driven filter turret offers a choice of filters and cap – including special effects filters.

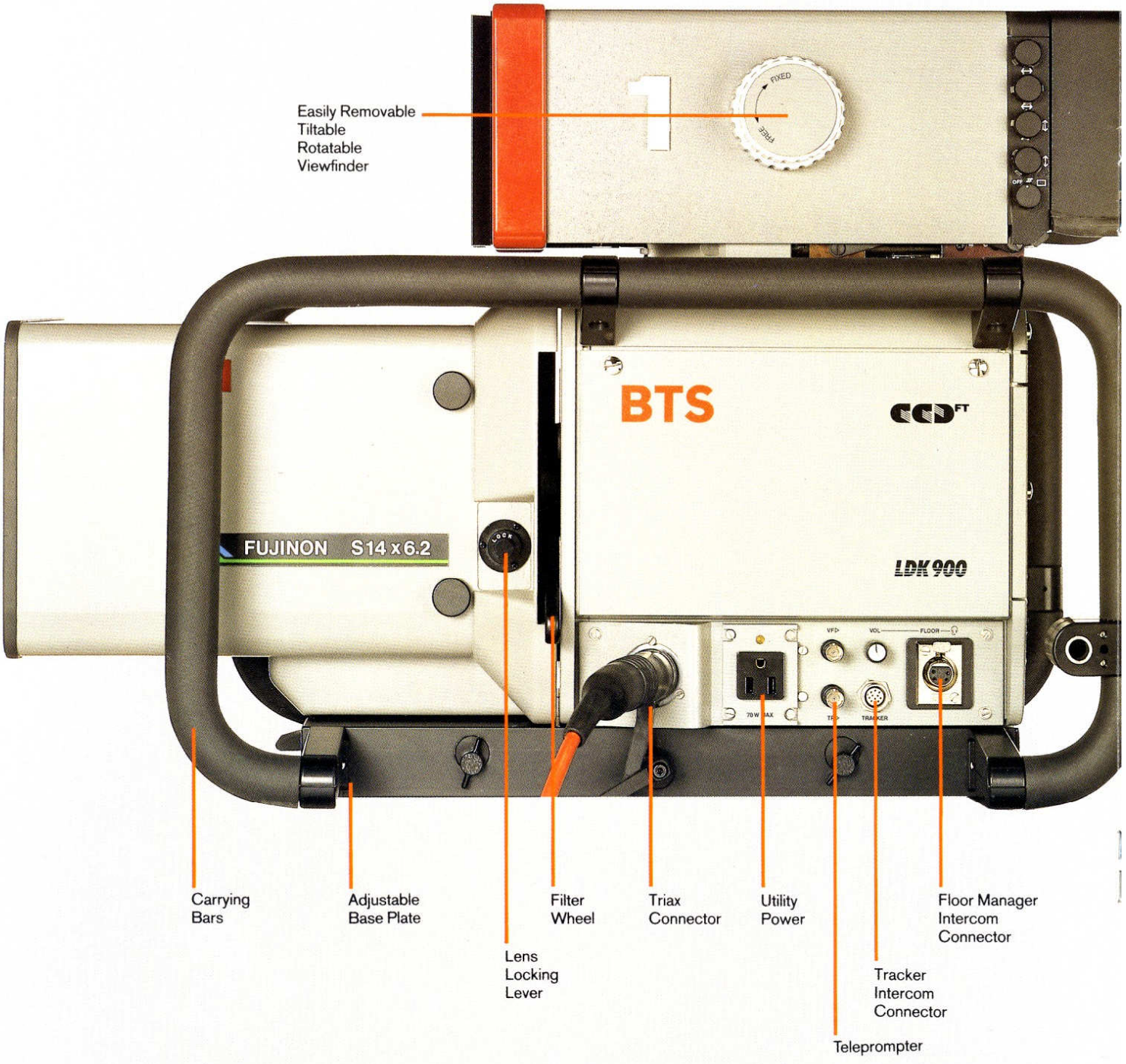
Feature-packed viewfinder

The electronic viewfinder has all the features – and more – required for good shooting. It has a 17cm (7″) tube of high luminosity and sharpness. There is ± 50° tilt and ± 100° rotation. There is an 'on-air' tally light. There are extensive markers and indicators including an adjustable safe area feature and "cross lines". And it is very easy to exchange and service.

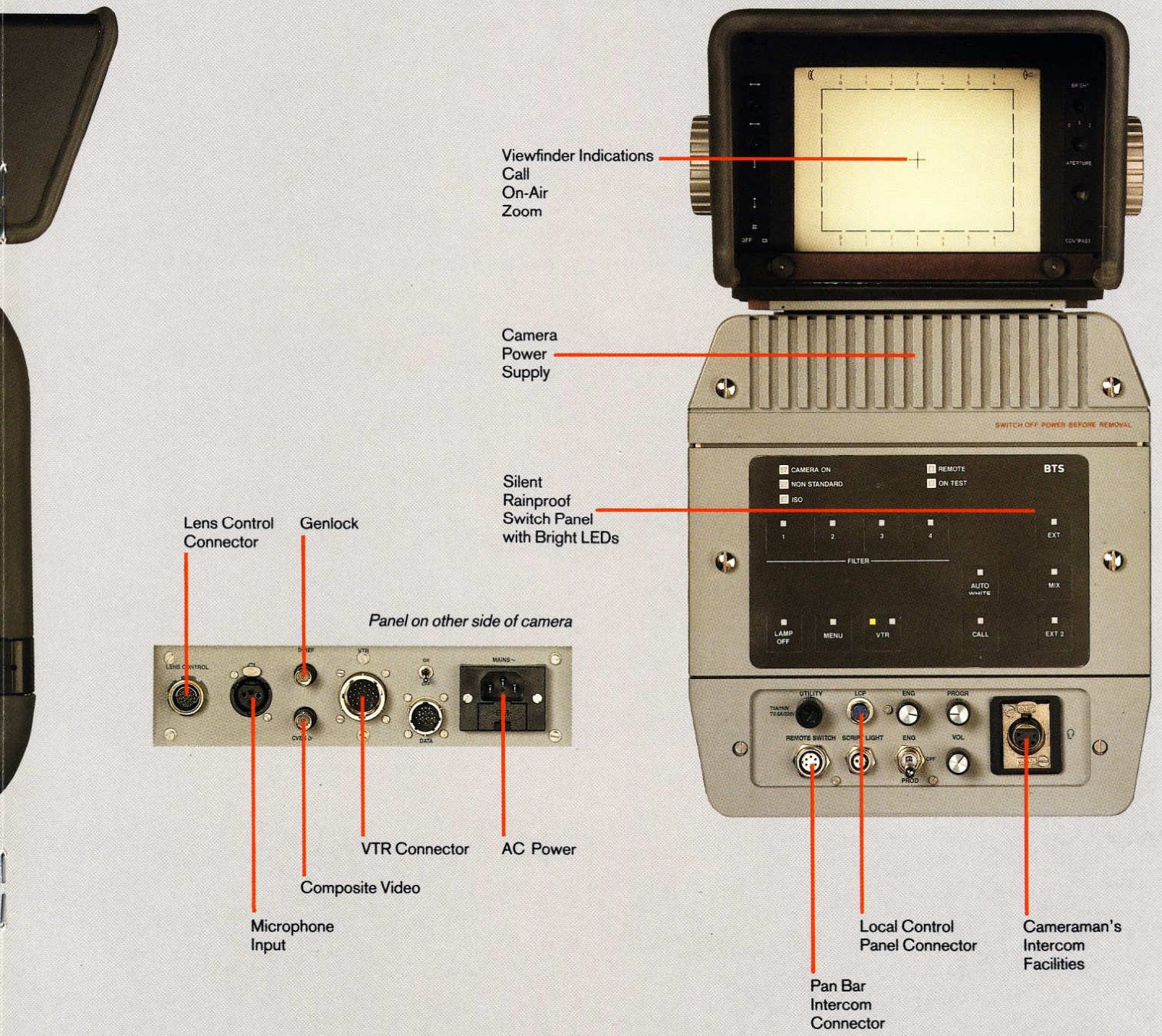
Fast action sports

The benefits of the CCD-FT pictures with no lag, smear or comet tailing are particularly useful in fast action programmes – particularly sport. Here the additional electronic exposure control allows sharp and clear slow motion or stop motion pictures to be obtained from a video recorder, which has recorded the camera output during high speed action shots.

LDK 900 so compact and light . . .



. . . and packed with features

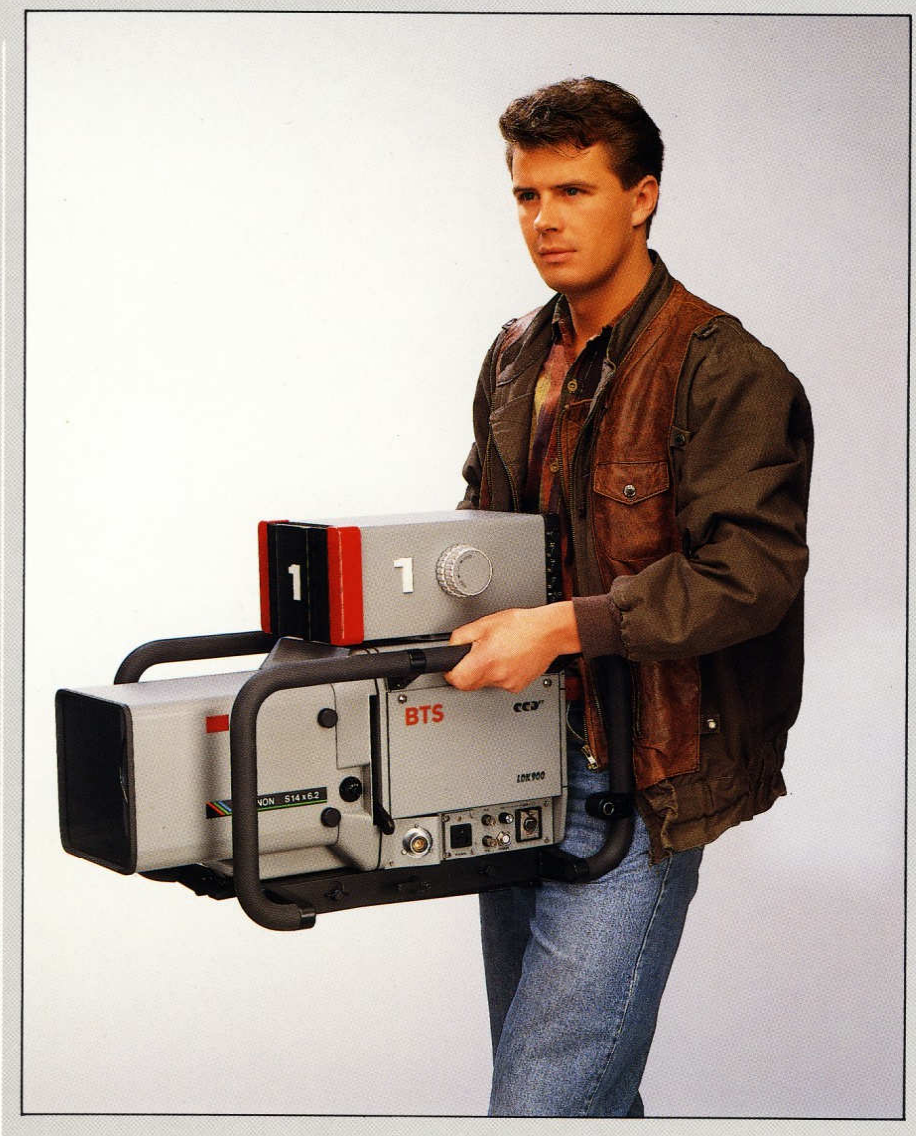


LDK 900 reliable, versatile . . .

The cameraman's camera

When BTS was developing the LDK 900, the company wanted to make sure that the ergonomics were precisely what cameramen wanted. It was already known that the camera would provide superior picture quality with FT-CCDs. Their light weight and small size would also allow the design team to concentrate on getting the optimum in ergonomics.

So experienced studio and outside broadcast cameramen from all over the world were asked for their advice in a specially organised workshop. The result is the smallest and lightest studio camera in the world. With a frame that makes it easy to lift and handle. There is an adjustable baseplate to enable the camera to be perfectly balanced on the tripod regardless of lens type. This also ensures a lower centre of gravity. With a very low optical axis. With a superb viewfinder. With great communications facilities. And with controls and switches that are located where cameramen want them.



On location

Rugged, reliable, rainproof and able to work over a wide range of temperatures, the LDK 900 is the ideal camera for location work. It is small and lightweight – and so easy to transport. Its frame makes it easy to handle and manoeuvre. It can be used alone with a VTR and Local Control Panel. It can be part of a multi camera system – including the LDK 90 – with its own Base Station and Operational Control Panel. Composite and component signals and full bandwidth RGB outputs for chromakeying over long distances are available. And the highest quality performance can be maintained for up to 2000 metres.

. . . yet so economic

Top team

The LDK 900 production camera has a fully compatible companion in the portable LDK 90 multi-role system camera. They use the same high performance CCD-FT sensors and the same optical block. Colour matching between the cameras is therefore perfect. Much of the circuitry is also common.

They use the same Base Station, Operational Control Panels and triax system. They can be used together or reconfigured for stand alone operation in seconds. They have the same input and output signals and the same connectors.

The LDK 90 with its low weight complements the LDK 900 and the two cameras make an ideal package for outside broadcast as well as studio use. And as there is complete interchange between system parts, including lenses, spares holdings can be kept to a minimum.

The combination therefore gives a quality of performance with an economy of operation that is just not achievable with other cameras.

Triax – reliable and flexible

BTS cameras pioneered the use of triax cable. And for such a light camera as the LDK 900, triax cable is eminently suitable. It is very light, very flexible, very reliable and very economic. For field use, up to 2000 metres of triax cable may be used from the camera to its Base Station, allowing the LDK 900 to be used in the most demanding situations.

The economic solution

So many factors make the LDK 900 one of the most economical production cameras on the market. CCD sensors do not deteriorate or need changing. They are stable and permanent. The sealed-in shutter is maintenance free. Even under rigorous working conditions the camera will prove extremely reliable throughout its life time. And it comes at a cost which is very competitive for its performance.

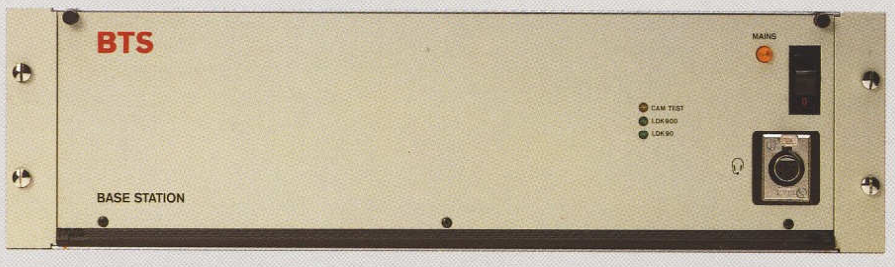
LDK 900 with full control . . .

Base Station

The Base Station is a compact unit 19 inches wide and 3 rack units high. It provides full bandwidth RGB signals as well as composite and component signals. Amongst other facilities are inputs for reference sync, two external videos for the viewfinder, communications (2 or 4 wire) and programme audio. There is also an output of high quality audio from the camera head microphone. The Base Station may be located up to 2000 metres from the LDK 900 using triax cable.

Operational Control Panel

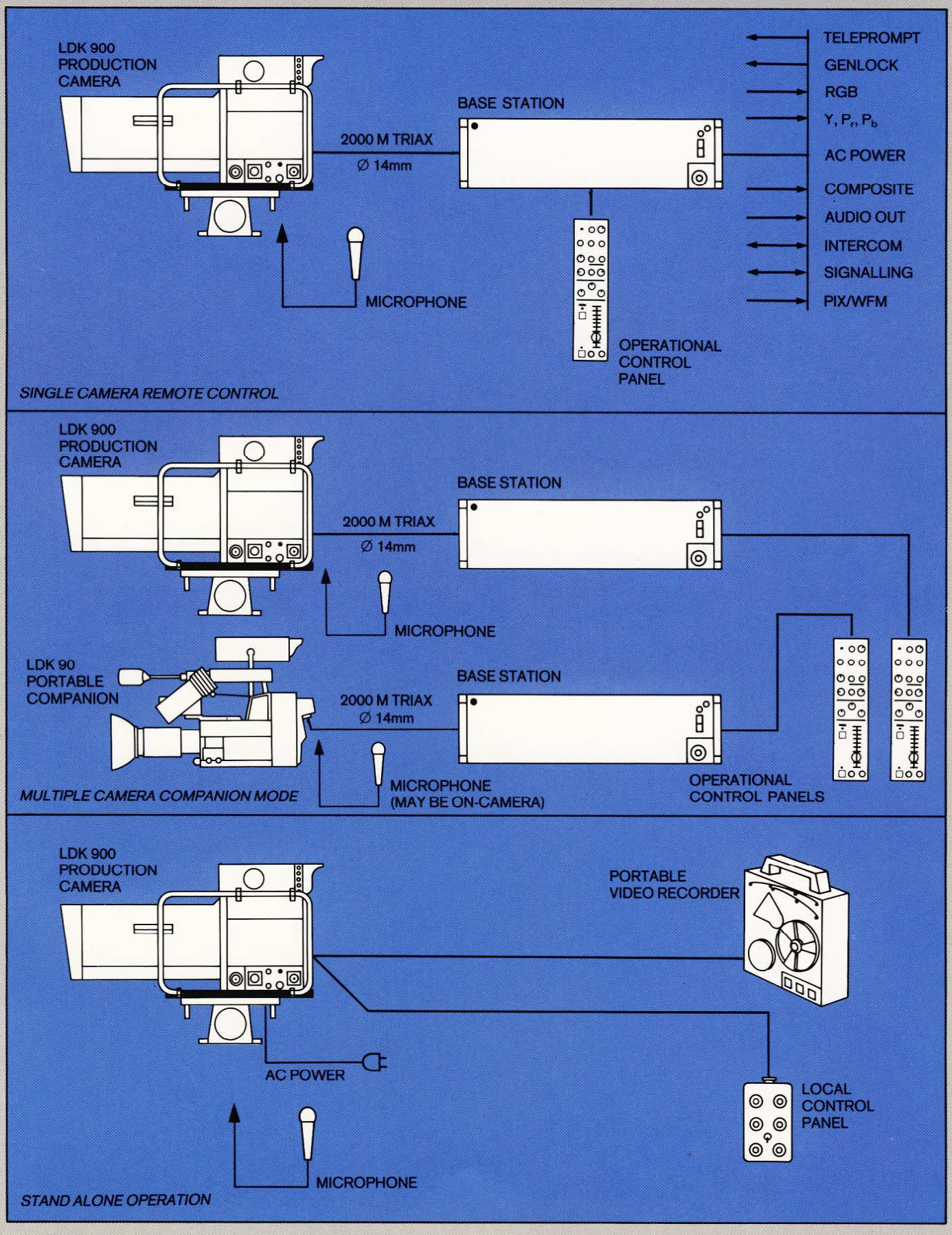
The Operational Control Panel is a single panel only 80mm (3.15″) wide and 320mm long (12.16″). It has all the functional controls including mono-knob control of iris and master black levels, individual RGB colour painting controls, colour temperature selection, gain control, gamma 1 and 2, knee function, contour selection and black stretch on/off. There are also controls for exposure, colour bar on/off and monitoring. The OCP may be connected to the Base Station by a standard 10 metre multiwire cable or, if required, a maximum of 350 metres of cable.



Local Control Panel

The small and compact Local Control Panel is for use with the LDK 900 in its 'stand alone' mode. It controls iris, master black level, individual gains and black level for red and blue.

. . . for all systems



Technical Data

Camera Head

Transmission system
PAL or NTSC

Power supply
220–240 V, 110–120 V } 48–410 Hz

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

Pick up device
3 Philips Frame Transfer CCD's

Picture elements
610 (h) × 492 (v) NTSC
604 (h) × 576 (v) PAL

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 S at VTR connector
Components (Y, P_r, P_b) at VTR connector
Viewfinder signal
Colour bars (Full field, EBU white level)

Sensitivity
1750 Lux (160 ft.cd.) at F/4.0 with 90% reflectance

Limiting sensitivity
54 Lux (2.5 ft.cd.) at F/1.4 and 12 dB gain.

Signal to noise ratio
At normal gain 58 dB NTSC, 56 dB PAL typical

Modulation depth
Horizontal modulation depth at 5 MHz typically 45% in Red, Green and Blue (equates to a limiting response > 650 TV lines|in a ⅔" tube camera)

Registration
Less than 25 nS (0.05%) in all three zones

Contour correction
Edge of band, contours from Red and Green

Geometric distortion
Negligible

Gain control
−6 dB, 0 dB, +6 dB and +12 dB

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

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

Contour correction
3 selectable levels pre select via Switch panel or remoted to OCP

Black level
0%, −10%, −20% pre select via Switch panel

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

Ambient temperature
Operating −20°C to +45°C
camera head + VF
Non operating −25°C to +70°C

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 Ø 8 mm triax cable 675 m
with Ø 11 mm triax cable 1200 m
with Ø 14 mm triax cable 2000 m

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)

Viewfinder

Power supply
+10.5 −14 Volts

Power consumption
30 W

Screen diagonal
170 mm

Luminance
800 cd/m^2

Picture sharpness
> 700 lines

Picture geometry
±1%

Frequency response
5 MHz ±0.4 dB
7 MHz −3 dB

Ambient temperature
−20°C to +50°C

Dimensions
Height: 135 mm (5.3")
Width: 190 mm (7.5")
Depth: 285 mm (11.2")
Weight: 7 kg (15 lb)

Base Station

Transmission system
PAL or NTSC

Power supply
220–240 V, 110–120 V } 48–410 Hz

Power consumption
Approx 280W 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)

These typical specifications are subject to change without notice.

BTS Broadcast
Television Systems GmbH
Robert-Bosch-Strasse 7
P.O. Box 110261
D-6100 Darmstadt
Fed. Rep. of Germany
Phone: 0 61 51 /808-1
Telefax: 0 61 51 /89 44 63
Telex: 419 256

BTS Broadcast
Television Systems Inc.
900 Corporate Drive
P.O. Box 618
Mahwah, New Jersey 07430,
USA
Phone: (201) 529 1550
Telefax: (201) 529 5843
Telex: 0223 762 558

BTS Broadcast Television Systems GmbH

A joint company of Bosch and Philips