

BTS

Broadcast Television Systems GmbH

A joint company of Bosch and Philips

LDK 9 Frame Transfer CCD Studio Quality Camera System



LDK 9 Studio Quality ...



LDK 9 – A Studio Quality Camera System with Top-of-the Line Performance and Professional Production Controls

The BTS LDK 9 is a Top-of-the-Line, Frame Transfer CCD studio camera with outstanding performance. It has the most extensive professional control system designed for broadcasters, and outperforms even the best tube cameras available.

With new generation Frame Transfer smear-free sensors, in combination with the ultimate in electronic processing, the LDK 9 sets a standard of performance unmatched in the broadcast market.

The wide band RGB triax system, allows the LDK 9 camera head to be remotied from the Base Station up to a maximum of 2400 meters, 7875 feet. This economic cable makes the

LDK 9 ideally suitable for outside broadcast mobile applications in sports programs as well as in studio use.

The LDK 9 has control panel options to suit every occasion. From simple stand-alone operation to an 8 camera system with two wire digital control and extensive remotes, the LDK 9 can be configured to suit every broadcast requirement.

Communications, the operational heart of any broadcast camera system, has been designed for the most exacting needs. Whether two or four wire standards are used, separate unique channels are available to provide production and engineering with

clear, quiet talk-back. Outputs at the camera head provide production staff on the studio floor with communication into the production system for floor managers and dolly and boom operators. The LDK 9 is also provided with two high quality audio channels for a commentator, news reader or for audio effects in outside broadcast situations.

The BTS LDK 9, designed for the 1990's, is the ultimate production tool, designed in conjunction with broadcasters for broadcasters.

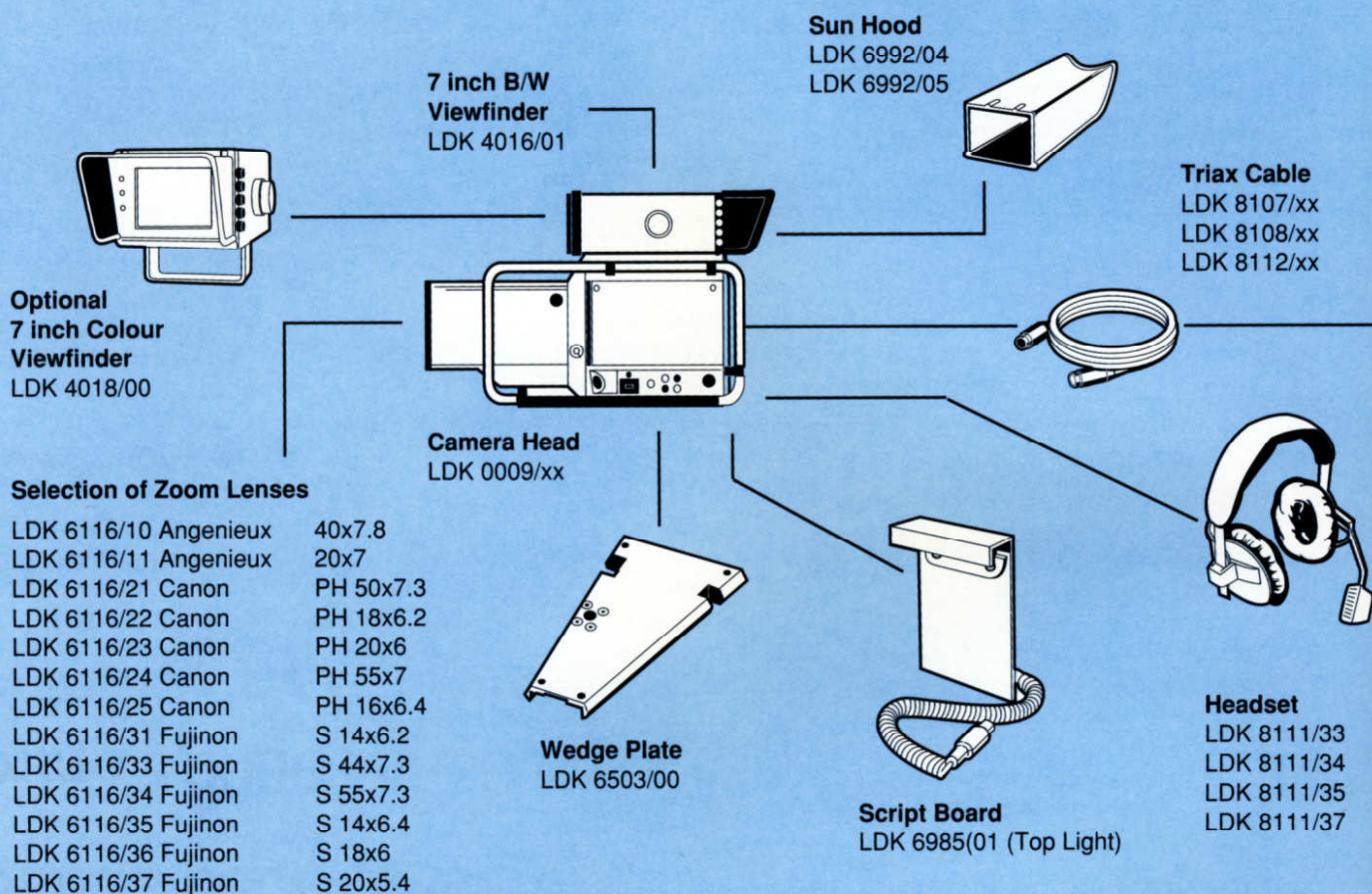
... with optimum broadcast performance

A Summary of Features and Benefits

- New Generation, Smear-Free Frame Transfer Sensors.
- Compensated Dynamic White Shading via lens file database.
- Fully integrated background automatics; black, white and shading.
- Self aligning Optical Interface to Camera.
- Fast exchangeable 8 position Filter Wheel Cassette.
- Camera Head weight approximately 21 Kg.
- Protecting all-around Carrying Handles.
- Integral Base Plate allows camera to be easily balanced whatever lens/camera combination is used and with or without teleprompter.
- Full Feature Viewfinder with high brightness, high definition 7 inch screen, and diagnostic messages.
- Optional colour viewfinder with component input signals.
- Two level On-Air indicators.
- Adaptive notch filter with ringing free pulse response.
- Reliable, economic triax cable up to 2400 meters, 7875 feet.
- Two high quality audio channels from camera head to Base Station with remote gain control.
- Most comprehensive multi-channel, two or four wire intercom system.
- Master Control Panel with clear, sharp, wide angle EL, Electro Luminescence, display.
- Remote camera select function input on Master Control Panel.
- Four scene files per camera and a factory or customer defined standard file.
- Personal backup memory Scene Files Card for complete system.
- Wide range of Series 9000 control options to suit every broadcast requirement.
- Self Test Diagnostic system.
- Remote lens control via Master Control Panel.
- Optional private data transmission over triax. e.g. RS 232 signals.
- System Remote Controls compatible with previous series cameras.
- LDK 91 performance compatible companion.
- Full range of Service items and BTS support World Wide.



LDK 9 complete range of accessories ...



Set of Matrices

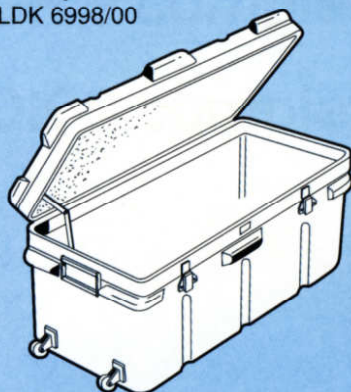
LDK 8550/28

Set of Identification Numbers

Camera Head LDK 6400/20
Base Station/RCP LDK 6430/30

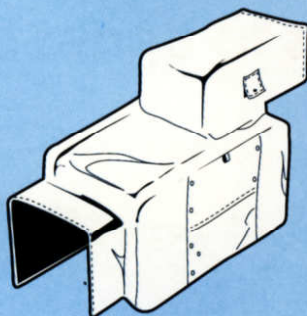
Transport Case

LDK 6998/00



Rain/Off Use Cover

LDK 6999/20



Spare Modules:

Camera Head*
LDK 8632/00/50
Camera Head*
LDK 8632/00/50
Base Station*
LDK 8635/00/50/70
Camera Head Power
LDK 8629/00
Base Station Power
LDK 8634/00

Spare Components Kits:

Camera Head*
LDK 8606/20
Base Station / RCP's*
LDK 8606/30

Set of Service Extenders:

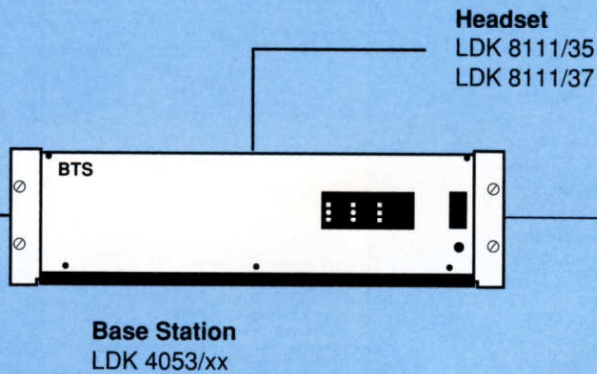
Camera Head
LDK 4830/20
Base Station
LDK 4840/10
Remote Control Interface
LDK 4840/20

* Above items supplied in flight cases

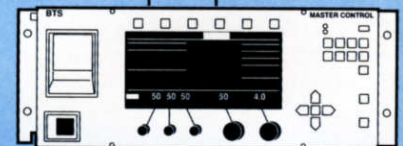
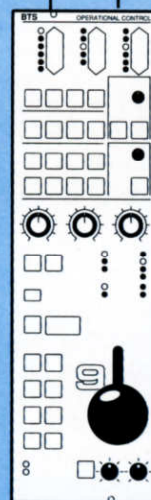
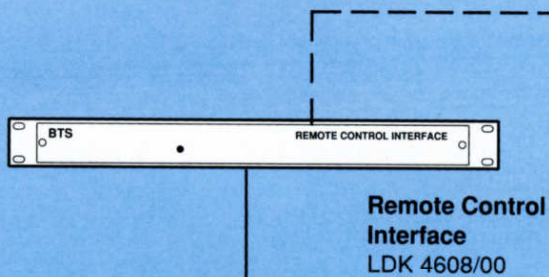
... and Series 9000 Control

Series 9000 Units

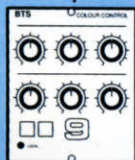
Version Numbers for Camera Head and Triax Base Station		
Version	Connectors	
	Triax	Headset
/00 50Hz	Fischer	Tuchel
/05 50Hz	ARD	Tuchel
/10 50Hz	Lemo	Tuchel
/50 60Hz	Tri-Lock	XLR5



Control Cable 4 p
LDK 8113/01
LDK 8113/05
LDK 8113/10
LDK 8113/...

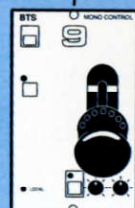


Colour Control
LDK 4626/00



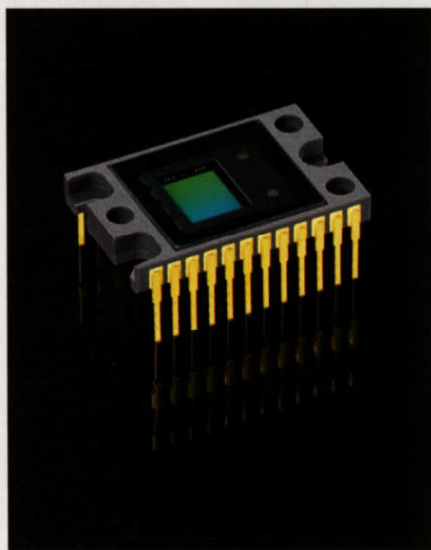
Control Cable 25 p
LDK 8192/01
LDK 8192/10
LDK 8192/...

Mono Knob Control
LDK 4625/00



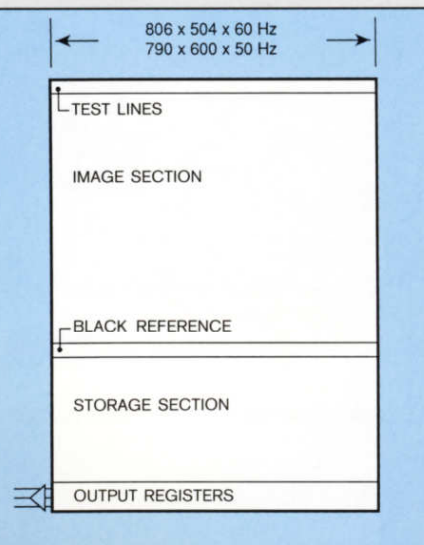
Memory Card
LDK 8561/00

LDK 9 with Frame Transfer CCD's ...



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 its place. The shutter is timed to operate during this transfer and it interrupts 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.



Why BTS Frame Transfer Sensors?

With over 20 years of work in research and development of CCD technology, BTS can claim to have more experience in CCD design than any other camera manufacturer.

This experience has led to the development of the only CCD image sensor with no smear at any level of highlight input to the sensor pixels.

Frame Transfer techniques, combined with a shutter, whose reliability has been proven in thousands of BTS broadcast camera products, is the only technology that can completely prevent smear. And this simple, unique, high pixel density design, has permanent and accurate geometry, high stability, and, no lag, comet tails or burn-in under any lighting conditions.

Other problems of conventional sensors, such as fixed pattern noise and moire, are of very much lower level in Frame Transfer sensors and beyond the normal bandwidth of current television system standards.

The BTS research and development programs, supporting our products in daily use, has developed sensor technology to the point where it can outperform tube based cameras, plus all the advantages of CCD sensors.

The New Generation FT Sensor

BTS declared policy of continued research and development into sensor design, has now provided the broadcast market with a Frame Transfer CCD of outstanding performance, totally free of smear effects.

This elegant design does not have shift registers in the light path, which in other sensor designs, takes up valuable space on the sensor image plane. This leads to a much more light efficient and simpler design, of minimal size and cost.

The image storage section, using the same technology, allows each frame of the picture to be moved from the image section into storage during vertical blanking, allowing use of the shutter. This shutter, timed to operate during the shift of charge packets, prevents incoming light from contaminating the next picture thus completely preventing smear.

This new generation sensor has a high pixel density image region providing a camera resolution beyond the needs of current television standards, more than 700 TV lines. It has a higher blue sensitivity, leading to an improvement in general camera sensitivity and improved camera signal to noise performance.

The LDK 9 Studio Quality Camera

From the start of the design stage, every known requirement of the broadcast market has been allowed for in the engineering specification of the LDK 9 camera system. In conjunction with broadcasters, the real needs of program production are taken into account, down to the smallest detail.

Outstanding electronic processing free from artifacts, the most extensive communications, two high quality camera audio channels and a remote control system to meet the most demanding requirements, are all part of the LDK 9 camera system. All this in a reliable, high quality proven design, guarantee day-one performance for the life of the camera, in whatever broadcasting environment it may be used.

LDK 9 Camera Head

The lightweight camera head, weighing approximately 21 Kg., has all round carrying handles for easy rigging and to provide protection for the camera casing.

The lens mounting allows for all available studio quality lenses, from manual to full servo and with zoom ratios up to 55 times and greater. Self-aligning mounting enables easy fitting and locking in the correct optical position.

... out performs the best tube cameras

The integral balancing plate enables a quick and easy camera balance to be achieved with any camera-lens combination. A camera safety lock is also provided to prevent accidental movement of the camera on its mounting.

The LDK 9 is provided with an 8 position quick change filter wheel cassette including effects filters.

- | | |
|------------|-------------|
| 1. Clear | 5. Open |
| 2. ND 0.6 | 6. 4pt Star |
| 3. ND 0.96 | 7. 6pt Star |
| 4. ND 1.2 | 8. CAP |

And with the lowest centre of gravity and optical axis, the camera can be readily manoeuvred, giving the operator complete artistic freedom.

LDK 9 Communications

Three channels of communication, between Base Station and camera head, provide the most extensive "talkback" system yet designed. These are for Engineering, Production and Program. Two further channels are provided for the Cameraman and Floor Manager from the camera head to Base Station and studio system.

A wide range of communications hardware is provided, to suit the range of current headset types including connectors. For NTSC users there is also an input for RTS carbon microphones popular in some studios.

The quality of audio performance is high and is designed to give clean, clear and quiet talkback in the most noisy outside environments.

LDK 9 Audio Channels

The LDK 9 has two high quality audio channels from the camera head to the Base Station, for effects, news, or commentators microphones.

These high quality circuits provide a broadcast facility frequently needed in modern operations and they can be Phantom Powered with the built-in power supply of 12 or 48 volts.



Camera Head Video Outputs

For stand alone use, or for a floor monitor there is a composite, (CVBS), video output from the camera head and a VTR output. This output signal may be controlled from the camera head or Base Station.

LDK 9 Viewfinders

The LDK 9 monochrome viewfinder supplied as standard, has all the features required for studio and outside broadcast productions. It has a 7 inch, 17 cm, very high brightness, high definition display tube. There is an electronic safe area and zoom indication and a character display for diagnostic messages, keeping the cameraman well informed. This sturdy mechanical design allows for $\pm 50^\circ$ of tilt and 100° of rotation. The viewfinder is also provided with a range of

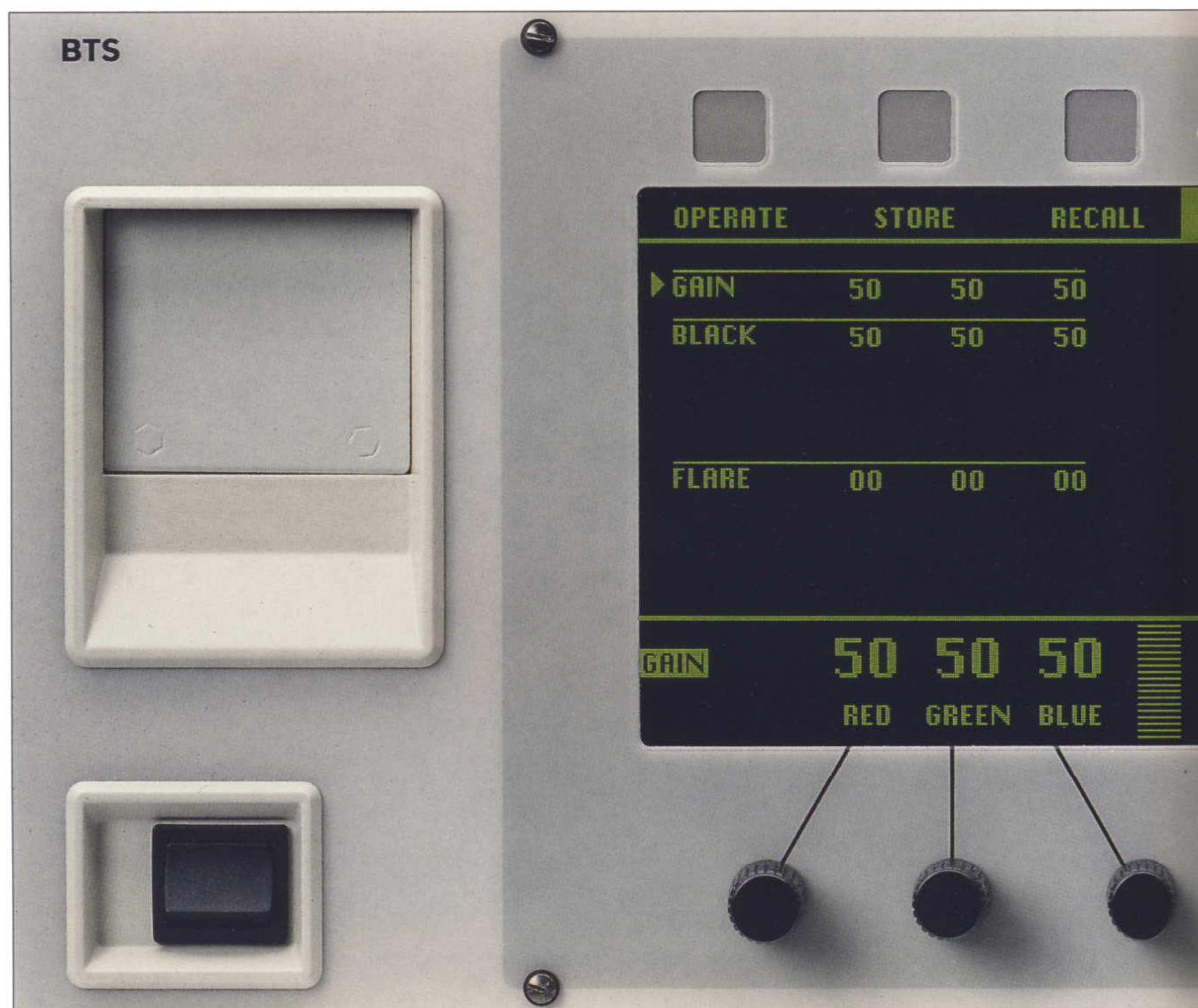
optional sun hoods to suit every television situation.

A colour viewfinder is available as an option and apart from the facilities mentioned above, the colour viewfinder is designed to accept a component input from the camera for the highest possible resolution.

Triax Base Station

The Base Station is a compact 19 inch standard, rack mounting unit, 3 rack units high. It is the processing centre for the camera head signals and signals from the outside world. It provides an interface to the remote control system with a in-built digital command system for the MCP and OCP and has rear mounted connectors for all system inputs and outputs. The Base Station can be located up to 2400 meters, 7875 feet, from the camera head.

Series 9000 Camera controls ...



Series 9000 Controls and Options

The BTS LDK 9 has the most extensive and professional remote control facilities, the Series 9000. From simple stand alone mode, with the LDK 9 camera head and Operational Control Panel, OCP, to a full and comprehensive multi-camera system with Master Control Panel, MCP, Operational Control Panel, Mono-Knob and Colour Control, there is a system to suit every application.

The connection between the OCP and MCP is a simple two wire, digital command system. Monoknob and Colour controls also can be interfaced to this digital system with the Remote Control Interface option, RCI.

Series 9000 remote controls are universal within the BTS family of Frame Transfer CCD cameras. They can be used with triax version cameras type LDK 90, LDK 91, LDK 900 and LDK 910. This enables current and future users to standardize on remote control facilities whatever mixture of BTS CCD cameras they have installed or are planning for the future.

The Series 9000 also allows customers to utilise most standard remote control panels as well as home made types using the Remote Control Interface, an important feature for television installations where a standard for camera remote control is used throughout the facility.

Master Control Panel

The Master Control Panel, MCP, is the heart of the remote control system in multi-camera operation. The electronics are housed in a 19 inch rack mounting unit, 4 rack units high.

The connection between the MCP and the camera system is a two wire data command line. In large camera systems two or more MCP's can be used in series and up to 8 Control Panels in combination with an MCP.

The Mono and Colour controls, if required, are connected to the Remote Control Interface. The RCI allows for most standard or customers own home made Mono and Colour controls to be used.

... for broadcast professionals



The control system allows up to 350 meters, 1150 feet, of two wire remote control cable to be used, sufficient for the longest cable runs in major studios.

The MCP has a menu oriented electro-luminescent, (EL), display to provide operational and camera setup information and displays of the diagnostic functions with access via a cursor controller.

The MCP is equipped with a built-in read/write capability using personal scene or setup SRAM file cards for backup. There is also a RS 232 interface connection for future use.

Divided into three logical areas, the MCP menu system provides a com-

plete status overview of camera parameters.

Above the display area are the hardware switches for menu selection. There are three main menus that can be selected for a particular application. These three function groups are related to studio configurations.

Scene File Card

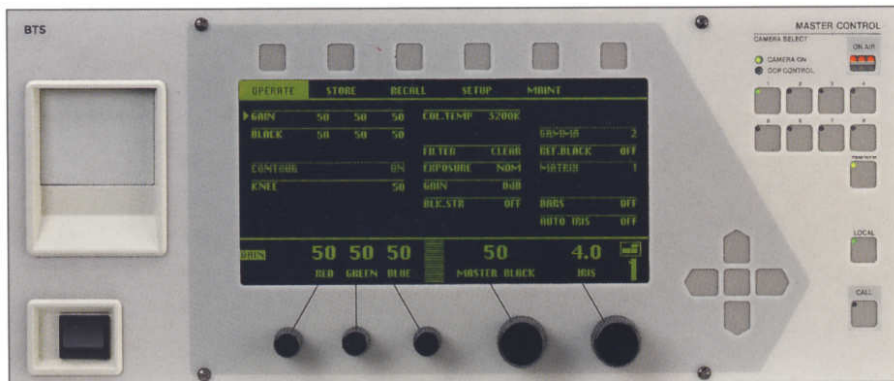
To aid complex production setups the Master Control Panel is provided with a memory card system for storing personal camera setup functions and operational functions. This is a small "credit card" size card of rugged design.

For a specific scene, all the camera data can be stored in this memory card for later recall or for archival purposes. Space on the card is provided for production and scene reference information for a maximum of eight cameras.

Television productions made over a long period, or at differing locations, or even on a day-to-day basis, can use this scene file card to ensure perfect matching of camera parameters and specific setups.

This simple and economic system, as an aid to television production, is designed to make the work of production people easier and with predictable results and camera performance.

LDK 9 precision electronic processing ...

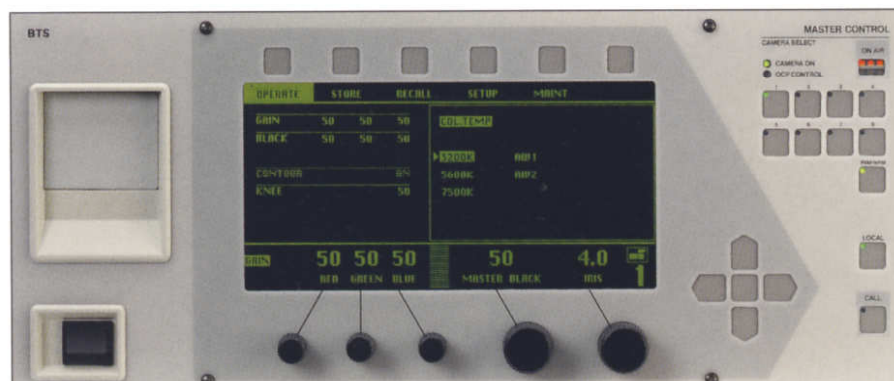


MCP Menu Functions Overview

Operate Menu

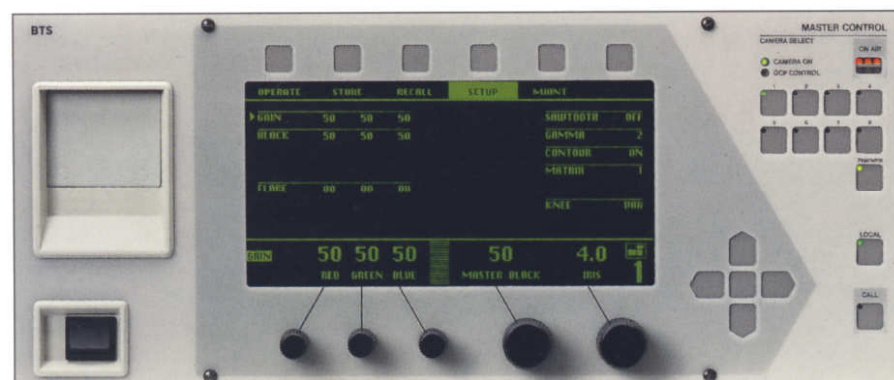
This menu can display operational functions found on the LDK 9 Operational Control Panel. At any one time, three of these parameters can be assigned to three analogue controls, at the bottom left of the MCP display, for adjustments to be made. In an area of the display above these controls the selected functions are repeated. At the bottom right of the display are the settings for Iris and Master Black level and just below, the analogue controls to adjust these parameters. Also displayed in this area is the camera number and the camera type, e.g., LDK 9, LDK 910 etc.

Assignable controls are selected by cursor control. When switch functions, displayed on the right hand side of the menu are selected by the cursor, a submenu is displayed. From this pop-up menu the cursor can be used to make any changes required.



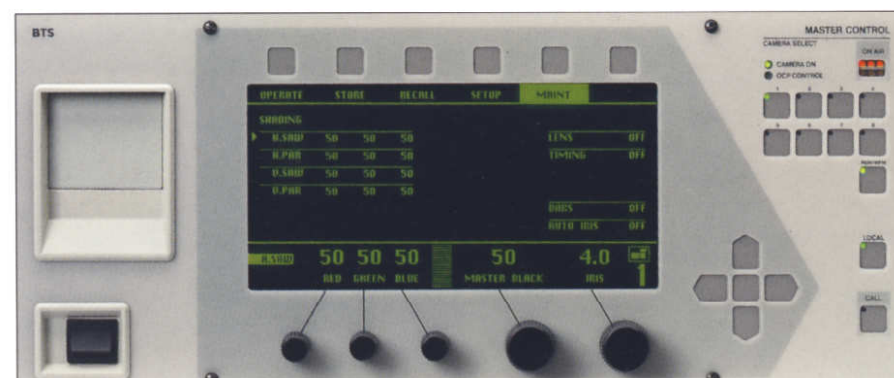
Setup Menu

This menu displays all other camera setup functions and allows them to be adjusted by the vision engineer to optimize more complex picture situations and for matching cameras.



Maintenance menu

Used by the maintenance engineer this menu displays all important engineering functions to allow the engineering staff to maintain and monitor the camera systems. An additional menu for store and recall provides access to storage, preview and recall of all files with or without the personal memory card. Instructions for using this memory are implemented in the system.



... with extensive remote controls

Operational Control Panel

The LDK 9 Operational Control Panel, OCP, is an 8 rack unit high, 351 mm, (14 inch), by 106 mm, (4 inch), wide panel. It has all the controls for remote operation of the camera channel.

The panel is divided into control areas for clear, recognizable selection of different camera functions. In the top section are found the picture and waveform monitoring selectors with corresponding LED indicators. In this section are colour temperature, lighting control and exposure control selectors and indicators logically grouped.

In the next lower section are push buttons for Gain, Black Stretch, and Filter Wheel each selecting a predetermined state. There are push buttons to select variable Black Stretch and Knee and the Contour control. The Enable button allows these three controls to become functional overriding any preset value.

Below this section are the Black and White painting controls and indicators for Knee, (Variable, Auto, Off) and Gamma, (Gamma 1, 2, Variable, linear). There is also On Air tally light, Colour Matrix and Chroma On/Off indicators.

The next lower section is concerned with the prime operational functions of Iris and Master Black control and Scene File selection. The Iris and Master Black control is a new, ergonomically designed Monoknob, with a forward and backward movement for Iris and rotate for Master Black. The range of iris control can be varied as can its center position. The actual F number for the lens in use is also shown. Scene files can be built up for specific camera settings. These settings that include painting, and other operational controls, are stored in four memories for instant recall. If required, the standard file, a factory preset or a customer defined file, can be recalled.



Series 9000 remote controls ...



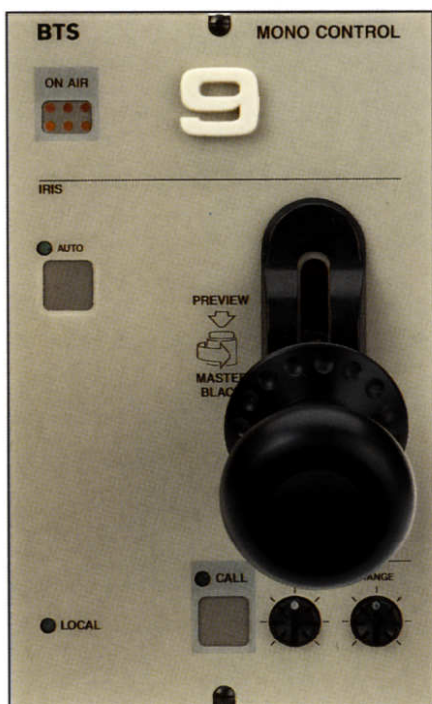
Remote Control Interface

The Remote Control Interface, RCI, allows the use of Mono and Colour control panels in system configurations where these functions are operated separately. It also allows the use of most standard or home made controls in television stations where existing remotes are preferred. The RCI is a standard 19 inch rack mounting unit, 1 RU, 44 mm high, (1.75 inches).

Mono-Knob Control Panel

The Monoknob Control Panel is an optional item, to allow for separate control of the main operational functions. It is a small panel, 173 mm, (6.8 inch), high and 106 mm, (4 inch), wide.

It provides a conventional monoknob control for Iris and Master Black, similar to the OCP control, and has the same Iris Range and Center controls. There is an On Air indicator at the top of the panel, an Auto Iris selector and a Local Control selector. A camera Call button and repeater light are also provided on this compact unit.



Colour Control Panel

Designed to match the Monoknob panel, the Colour Control Panel is the same width, 106 mm, (4 inch), for vertical in-line control desk mounting. However it's height is less than the Monoknob panel being only 128 mm, (5 inch), high.

This unit, which is also optional, provides red, green and blue gain and black level controls for painting and an enable button with repeater indicator.

Remote Control for Broadcasters

The range of LDK 9 control panel options, allows the user to select control options to suit particular broadcast applications. In simple one camera stand alone mode, only the OCP is needed to provide full, comprehensive control of operational functions. While in a multiple camera studio, the Monoknob and Colour Control panels can be used in a more conventional, studio remote control setup. This is also true of the larger outside broadcast units that normally have separate camera operation areas.

Whatever your broadcast system demands, the LDK 9 can provide remote control options to suit, with simple and economic two wire connection, over 350 meters, (1150 feet).

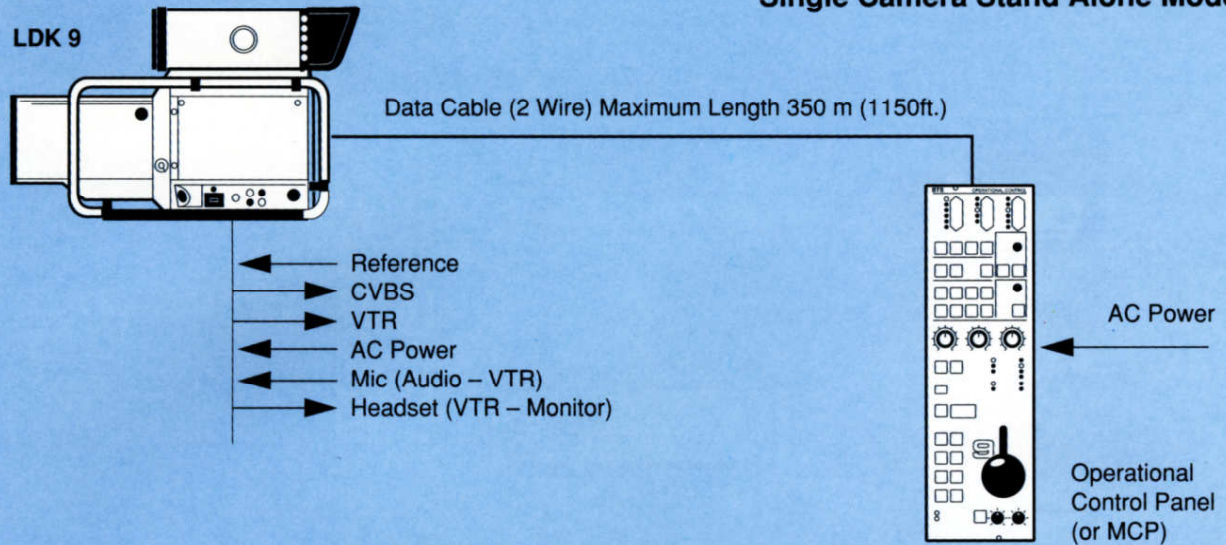
BTS Support and Service

With over 60 years of experience in the industry, BTS can claim to have been longer in the world of broadcast equipment manufacture than any other company. For our customers, this equates to a knowledge of their needs in support and services, provided all over the world and backed up by our parent companies, Bosch and Philips.

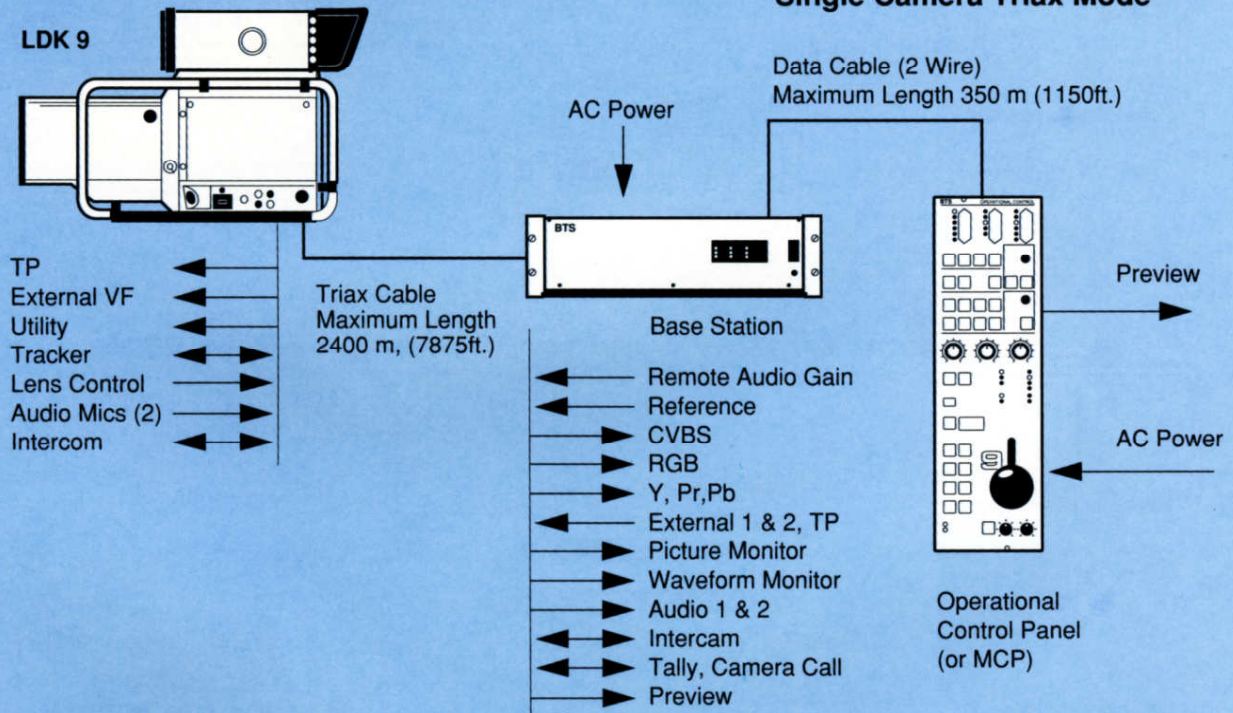


... and operating modes

Single Camera Stand Alone Mode

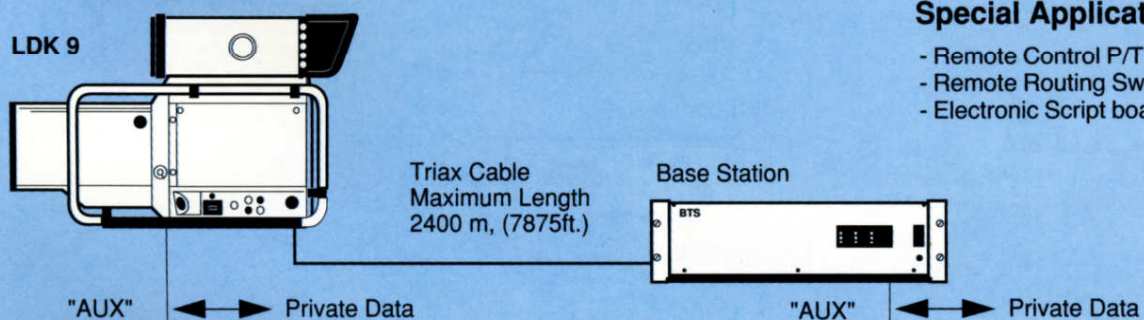


Single Camera Triax Mode

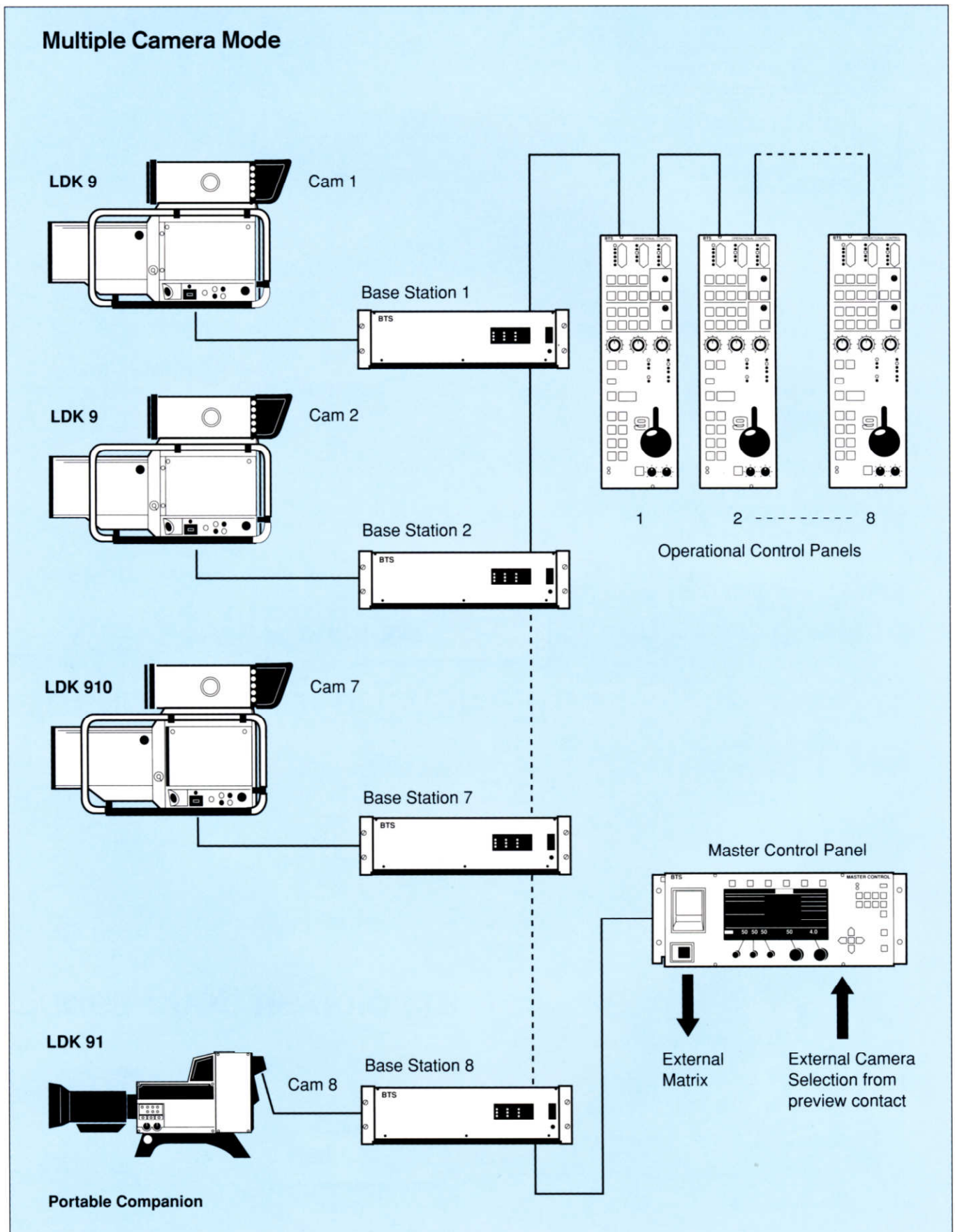


Special Applications

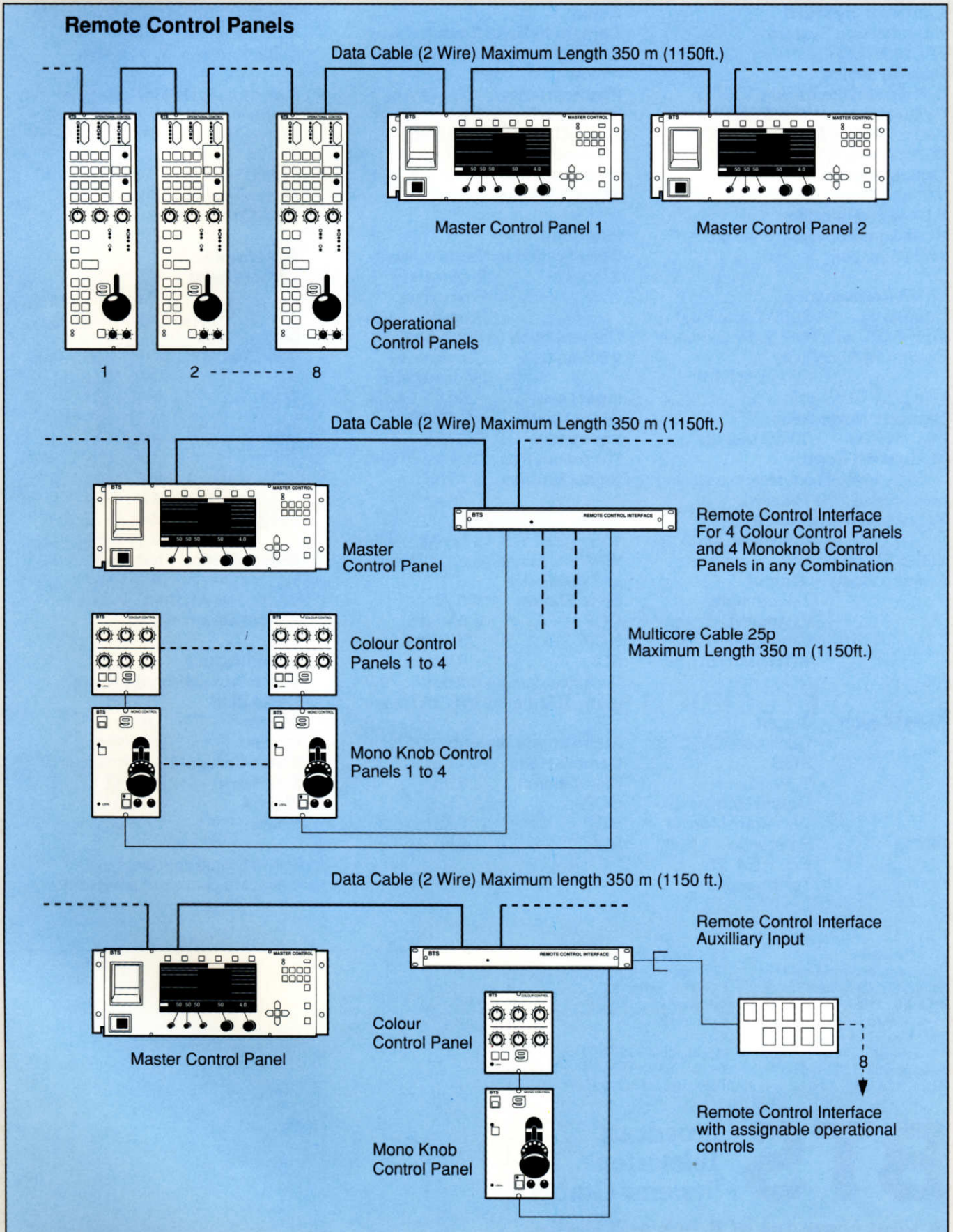
- Remote Control P/T Heads
- Remote Routing Switcher
- Electronic Script board



Series 9000 flexible control ...



... for all broadcast applications



Technical Data

Camera System

Transmission System:

PAL or NTSC

Pick-up device

3 Philips Frame Transfer CCD's

Picture elements **Total Pixels**

790h × 600v PAL 474,000

806h × 504v NTSC 406,000

Optical system

1/2 inch format

F1.4 with quartz filter

8 position filter wheel cassette —
exchangeable

Video Performance:

Sensitivity 2000 Lux at F4.0

Gain 0 dB, with 89.9 % Reflectance

Maximum Sensitivity

32 Lux at F1.4

with plus 18 dB gain

Signal to Noise Ratio

PAL / NTSC 60 dB / 62 dB

Modulation Depth

> 55 % in RGB equates to a limiting
response of 700 TVL.

Registration (in all three zones)

< 25 nSec (0.05 %)

Video Signals:

Camera Head — Output

Teleprompter

External VF

Composite CVBS

VTR (SMPTE)

Input

Reference

Base Station — Output

Composite CVBS(3)

RGB

Y, Pr, Pb

Picture Monitor

Waveform Monitor

Inputs

Reference

Ext. 1, Ext. 2

Teleprompter

Audio:

Camera to Base Station

Two high quality audio channels with
remote gain control.

Phantom Power 12 or 48 Vdc

Input Level — 64 / — 24 dB

Output Level + 6 / 0 dB

Impedance 600 ohm

Frequency Res. 40 Hz — 15 KHz

Signal to Noise > 59 dB

Intercom:

Base Station to Camera head:

3 Inputs — Engineering

Production

Program

Camera head to Base Station:

2 channels — Cameraman

Floor manager

Input Level — 64 / — 24 dB

Output Level + 6 / 0 dB

Impedance 600 ohm

Frequency Res. 150 Hz — 7 KHz

Signal to noise > 46 dB

Power Consumption:

115 — 230 V ± 15 %, 47 — 63 Hz

80 Watts (stand alone) including lens
and viewfinder

Base Station 250 Watts*

OCP 5.5 Watts

MCP 23 Watts

RCI 9 Watts

*includes camera head, VF, 70 VA
utility, 700 meters triax and lens

Approximate Weights:

Camera Head 21 Kg

Base Station 28 Kg

OCP 3.5 Kg

MCP 6 Kg

RCI 5 Kg

Operating Ambient temperature:

Camera Head — 20 to + 45 °C

Other Items 0 to + 45 °C

Maximum Cable lengths:

Camera head to Base Station

8 mm Triax 675 M 2215 ft.

11 mm Triax 1200 M 3937 ft.

14 mm Triax 2000 M 6562 ft.

16 mm Triax 2400 M 7875 ft.

Data Control Cable (4p and 25p)

350 M 1150 ft.

Dimensions:

Camera head 320, 240, 300
 (12.6) (9.5) (11.8)

Length, Width, Height including
bottom plate.

Base Station 482, 132, 482

(19) (5.2) (19)

OCP 106, 351, 119

(4.2) (13.8) (4.7)

MCP 482, 177, 120

(19) (7.0) (4.7)

RCI 482, 44, 275

(19) (1.7) (10.8)

Mono Control 106, 173, 97

(4.2) (6.8) (3.8)

Colour Control 106, 128, 30

(4.2) (5.0) (1.2)

Width, Height, Depth in mm. Figures
in brackets are inches

Viewfinders

7 inch Monochrome (17 cm):

Resolution 700 TVL

Weight 7.0 Kg

Power 30 Watts

7 inch Colour (17 cm): Optional

Resolution 350 TVL

Weight 8.0 Kg

Power 42 Watts

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: 06151/808-0
Telefax: 06151/894463
Telex: 419256

BTS Broadcast
Television Systems Inc.
P.O. Box 30816
Salt Lake City
Utah 84130-0816
USA
Phone: (801) 972-8000
Telefax: (801) 972-0837
Telex: (0230) 388-352

BTS **Broadcast
Television
Systems GmbH**
A joint company of Bosch and Philips