PHILIPS

Colour Camera

Type LDK 5

Operational flexibility

All video processing in camera; coded output, less vulnerable to interferences

Sync-locking to studio timing reference; colour black or CVBS

Different cable and RF modes of operation

Outstanding stability by monolithic design of optical and coil system, automatic positioning, and high gain-high feedback operational video amplifiers

1-inch Plumbicon* tubes; Anti-Comet Tail; minimum lag

Sturdy, magnesium-alloy cast camera housing

Rotatable and tiltable viewfinder

Wide range of zoom lenses available

Small base station in self-contained sections with simple interconnections

Digital control system; low data rate (2400 Bd)

CLUE facility

This new studio colour camera chain for both indoor and outdoor use fulfils the requirements of modern television broadcasting. It is a modular design consisting of a low-profile camera and a small base station. For operational flexibility, the base station is split up into self-contained sections, which may be arranged together or separately, as required. For the same reason, camera and base station can be interconnected by different types of cable and radio link. Suitable means for the interconnection of the standard camera chain are: a triaxial cable (i.e. a coaxial feeder with an extra outer screen); a thin multicore camera cable (having at least 3 coaxial feeders and 2 d.c. wires); a coaxial cable or RF link (signal bandwidth 40 MHz); or a coaxial cable or RF minilink or laserlink (signal bandwidth 7 MHz) in conjunction with a two-wire connection or RF link. Camera and base station provide the signal waveforms required in each particular mode of operation, at multiple outlets. Frequency multiplexing is employed to allow the two-way transmission of modulated HF carrier waves over a single conductor. Composite colour signals coded in accordance with the PAL, NTSC or SECAM systems are used, because these signals have been engineered for transport. A digital system, with memory in the camera, is used for the operational control of the camera, all operational controls being arranged at the base station. In the coaxial and RF modes of operation, the power supply section of the base station is transferred to the camera position. The triaxial cable link between camera and base station can have a length of up to 2800 m, depending on the type of cable used.

*Registered Trade Mark for television camera tubes

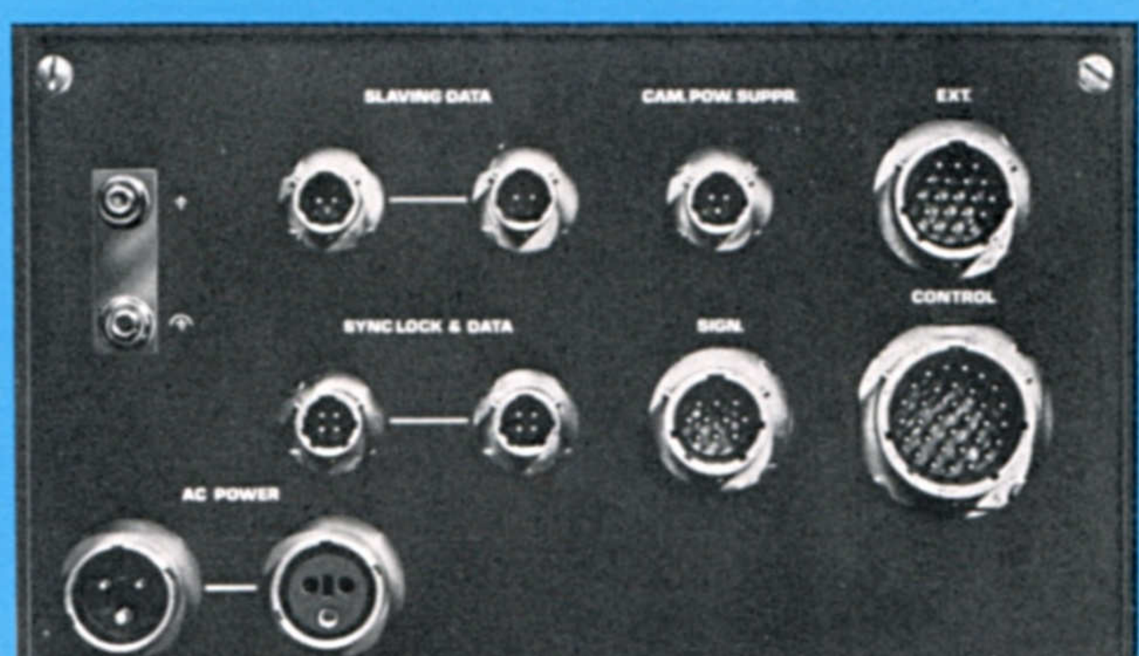
Pye TVT Limited

The Broadcast Company of Philips

sensing loop using a 100 kHz FM modulated feedback signal. The power supply system is short-circuit proof and switches down to a safe voltage level, if the connection with the camera should be interrupted. The unit is arranged in or near the base station in the triaxial and multicore cable modes of operation, and near the camera in the coaxial and RF modes of operation.

For monitoring purposes on viewfinder and base station monitors, either R, G, B, -G or overlay combinations of these signals can be selected for picture registration. Moreover, signal combinations can be switched on in the CLUE mode (4 lines of the G camera signal alternated with 4 lines of the R or B camera signal or of an external signal for check-up on signal levels and gamma tracking).

Three audio channels are normally available for intercommunication between base station and camera. They are used for production talk-back, engineering talk-back and programme sound.



Surveillance Unit LDK 4310. Front and rear view

Survey of LDK 5 camera operating modes.

TECHNICAL DATA

Systems
PAL (B, G, H, I) 625 lines, 50 fields/s,
or
PAL (M) 525 lines, 60 fields/s.
or
NTSC 525 lines, 60 fields/s
or
SECAM, 625 lines, 50 fields/s.

Power Supply
110, 117, 220 and 234 V ±10%;
50 or 60 Hz

Power Consumption
approx. 500 W

Input Signals
(a) 'Colour black' or CVBS loop through 75 Ω with sync component of 0·15 to 0·6 V_{pp}.
(b) Composite sync loop through 75 Ω, 1–8 V_{pp} negative; plus subcarrier loop through 75 Ω, 0·5–2 V_{pp}; plus PAL identification loop through 75 Ω, 1–8 V_{pp}, waveform of any duty cycle. Line following positive going transient has + (R–Y).
(c) The camera's own CVBS signal, 75 Ω non loop-through.
The input signals must have the correct ratio between subcarrier frequency and line frequency. The camera signals are correctly timed with respect to the sync-lock input terminals with input combinations 'a' and 'c' or 'b' and 'c'.

Output Signals
4 × coded composite colour signal (CVBS), 1 × CVBS+VIT signal 1 × B-Y signal (in multicore mode)
All signals positive going, 1 V_{pp} into 75 Ω

Scene Illumination
1000 lux (100 ft cd) for a signal-to-noise ratio of 45 dB in the Y-channel; lens iris f/2·8 (f/2·8 is about equivalent to f/4 with 1¼-inch Plumbicon tubes); reflection factor 60%; with linear matrixing; without contour correction; with 5 MHz bandpass filter; at 40% of peak white

Resolution
In the Y-channel, without contour correction; 40% modulation depth at 5 MHz in the picture centre

Colour Registration
Deviations of Red or Blue in any direction with respect to Green:
In an ellipse with axes 0·9 of the picture height and width, deviations will be no more than the distance equal to a horizontal scanning time of 25 nanoseconds. Within a circle of a diameter equal to the picture width, deviations will be no more than 50 nanoseconds.
Outside this circle, deviations will be no more than 100 nanoseconds.

Geometry Error
Maximum 0·5% of the picture height, within an ellipse with axes 0·9 of picture height and width:
In the remaining picture area, maximum 1%;
Lens errors not taken into account

Gain Control
Master selector for: 0 dB, +6 dB and + 12 dB;
Individual controls for plus or minus 3 dB in Red and Blue

Colour Temperature Control
5-step selector for: +1000, +2000, +3000, +4000 and +5000° K, above the nominal colour temperature of 3200° K
4 position wheel for the optical filters; clear; colour no. 85; combined colour no. 85 and N.D. 0·9, and Cap. Slide for insertion of additional filter.

Gamma Correction
Selector for linear operations and gamma =0·35 and 0·5.
Gamma tracking: in the white region better than 0·5%,
in the black region better than 0·25%

Black Level Adjustment
Master control for adjustment between −65% and +35% of the nominal white level;
Individual control in Red and Blue for adjustment between −20% and +20% of the nominal white level

Contour Correction
Negative contour modulation; level-dependency and comb filter; noise slicer.

Lenses
A wide range of manually and servo-controlled zoom lenses is available

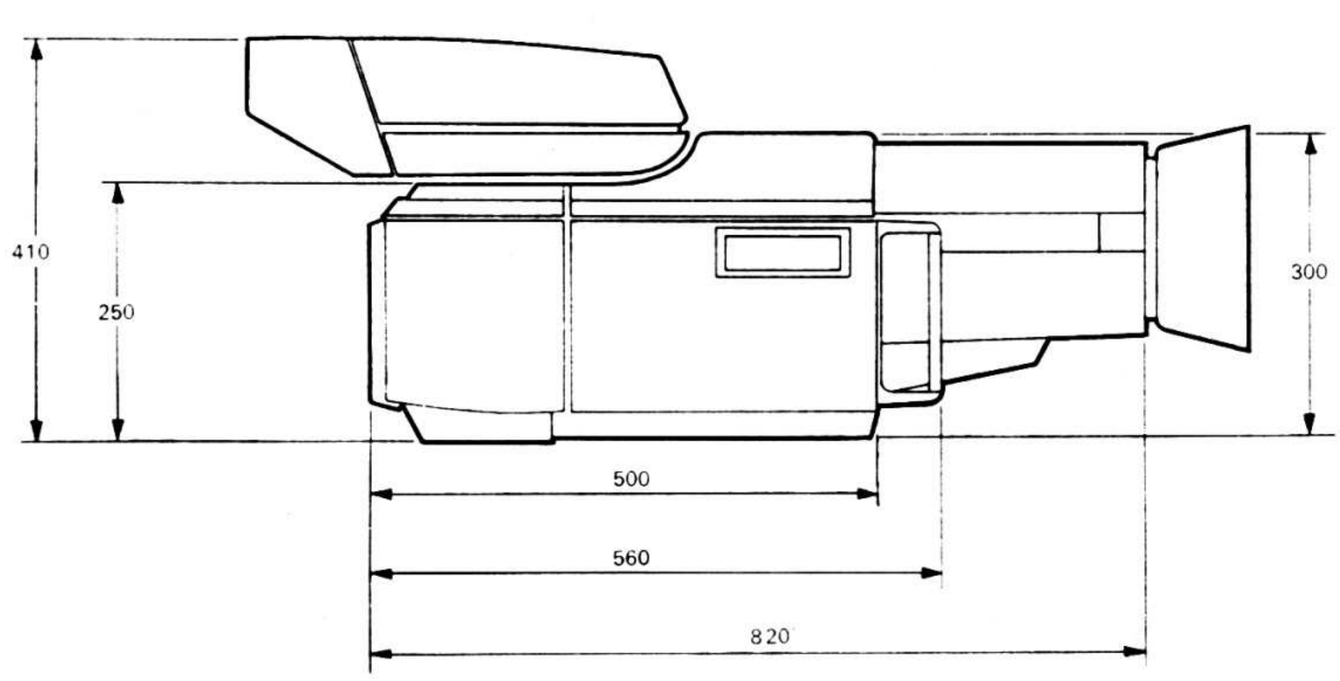
Permissible Ambient Temperature Range
−15 to +45° C

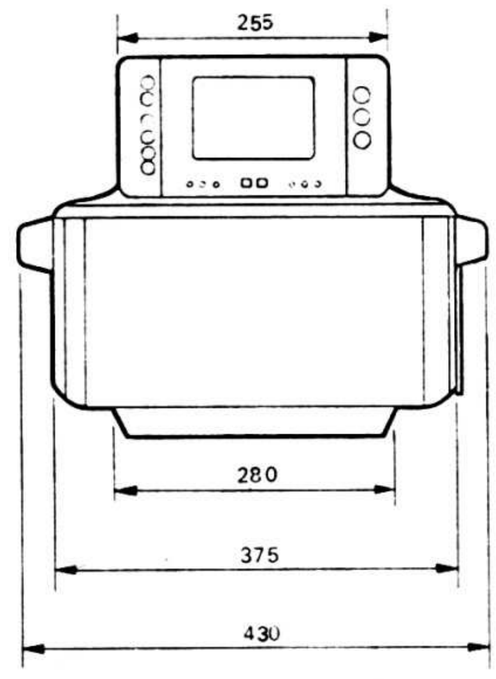
Viewfinder
Type LDK 4305;
Picture tube, type M17–141 W;
screen diagonal 17 cm;
high brightness 250 ft lamberts
X-ray radiation conforming to DHEW Rules 21 CFR 278 (USA performance standard).

Weights
Camera without viewfinder or lens:
approx. 33·5 kg (73 lb)
Viewfinder: approx. 8 kg (17 lb)
Lens: approx. 18 kg (40 lb)
Base station: approx. 33·5 kg (73 lb)
of which reception unit=9·5 kg,
camera power supply unit=16 kg
and surveillance unit=8 kg

Dimensions
camera: see dimensional drawings:
dimensions in mm;
base station units, each: height 130 mm
width 205 mm
depth 432 mm

Specification details subject to change without notice





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A member of the Pye of Cambridge Group

Printed in England

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THE CAMERA

Camera and viewfinder are built into lightweight magnesium-alloy cast housings. The viewfinder is tiltable, rotatable and removable. Zoom lenses with servo-controlled iris and manually controlled focus and zoom, as well as with full servo control, are available. The lens is hooked to the camera and fixed into position by means of a bayonet fitting. The manual lens controls are integral parts of the camera and engaged internal, rigid shafts which in turn are coupled to the lens mechanisms for focus and zoom control. This design obviates the use of external flexible cables.

A key aspect of the mechanical design of the camera is the horizontal spider layout of the pick-up section. This section, which comprises the colour beamsplitting prism and the deflection units with camera tubes, is incorporated in one machined, magnesium cast block. This block is screwed to the camera front, to which the lens is also clamped. In this way, the whole optical part of the camera forms one rigid structure ensuring maximum alignment precision and registration stability.

The camera employs the new 1-inch Plumbicon tubes, type XQ 1080, in conjunction with deflection units of utmost mechanical and electrical precision. These tubes of separate-mesh construction are fitted with a ceramic centring ring, which reduces the tolerances in optical alignment and improves the fixing of the tube target with respect to the optical image. An anti-comet tail (ACT) gun design ensures better highlight handling. An internal bias light conductor gives a uniform bias lighting of the tube target, and the resultant, artificial dark current reduces beam discharge lag. The Plumbicon tube is inserted into its deflection unit from the rear, so that the latter need not be removed from the camera for tube exchange. The deflection coil assembly has a mu-metal shielding in one piece, for optimum screening against external magnetic fields.

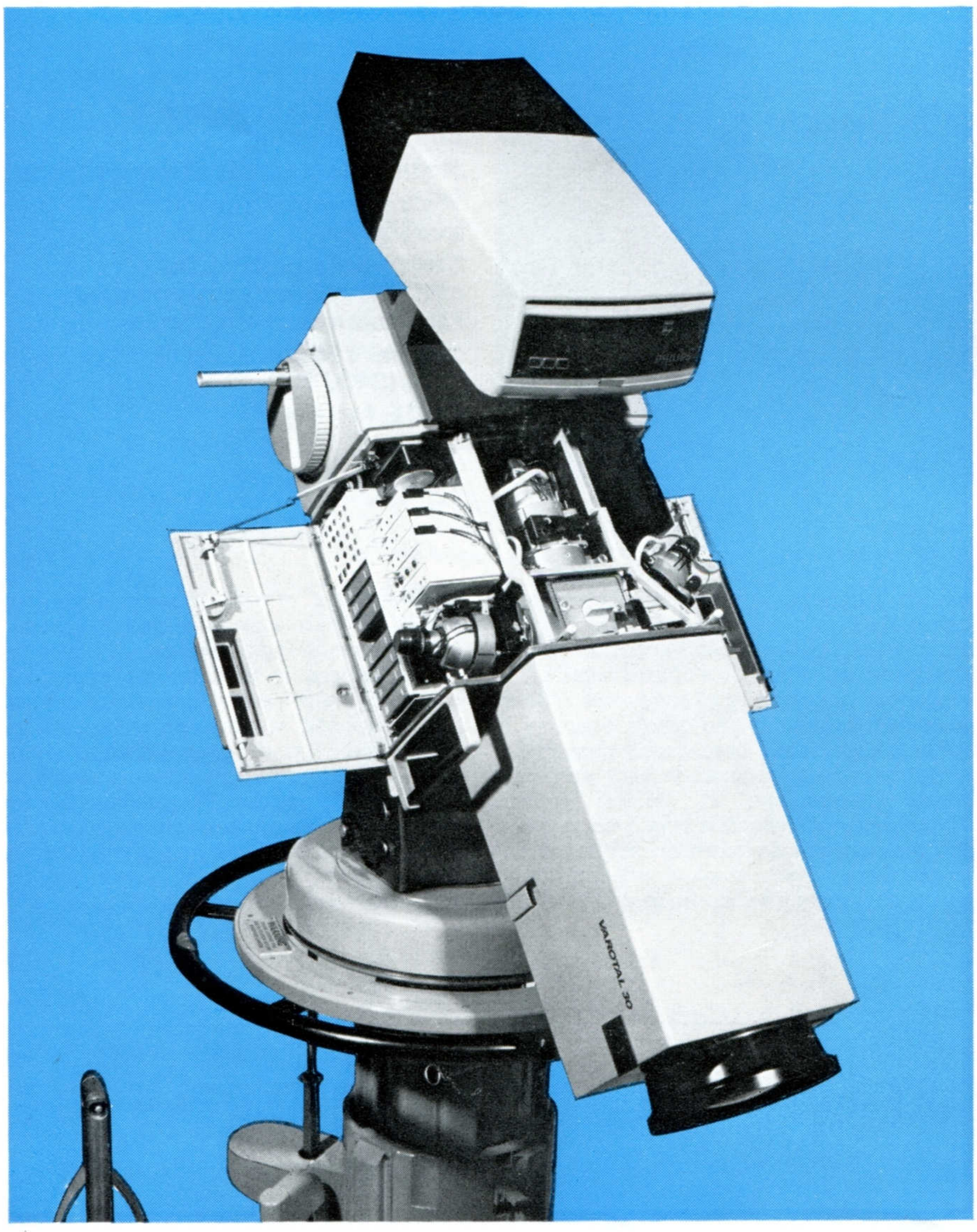
In addition to the complete electronic circuitry for sync generation and scanning, video processing and encoding, and Plumbicon supply, the camera contains the necessary circuits for processing the control data from the base station and for modulating and frequency multiplexing. With the exception of the horizontal and vertical fine shift controls, which have been automated, all registration and tube setting controls are presets located in the camera.

The deflection circuitry operates on the corrections-added principle. Master generators for line and field deflection provide identical scanning waveforms for all three camera channels. Corrections of only a few per cent of the total scanning are added to the waveforms.

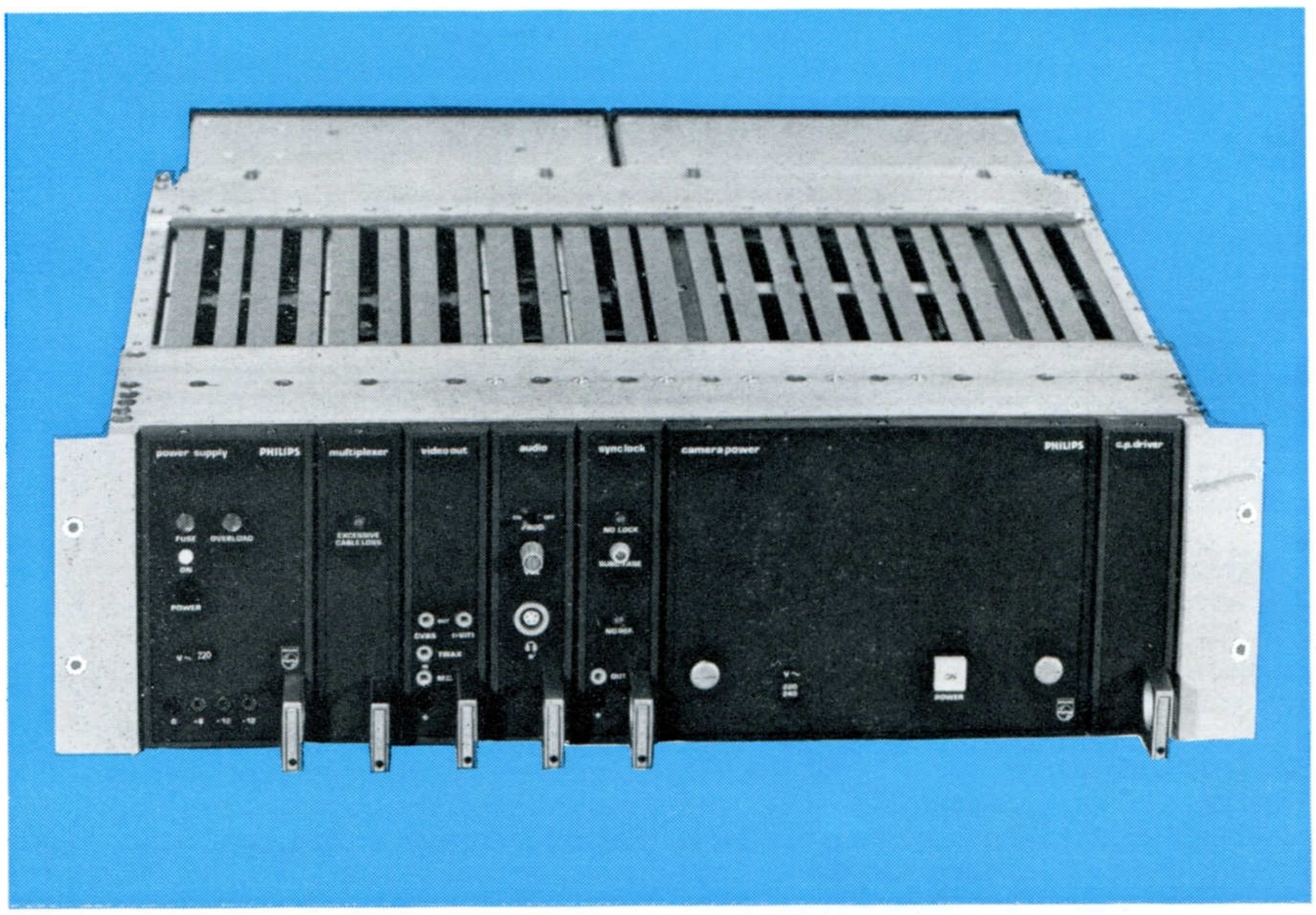
A sync-lock system in the base station compares the camera output signal to the studio timing reference and on finding synchronisation errors generates digital correction information that is sent to the camera through the command system. This correction information effects near-instantaneous time coincidence of the camera sync signals with the studio reference.

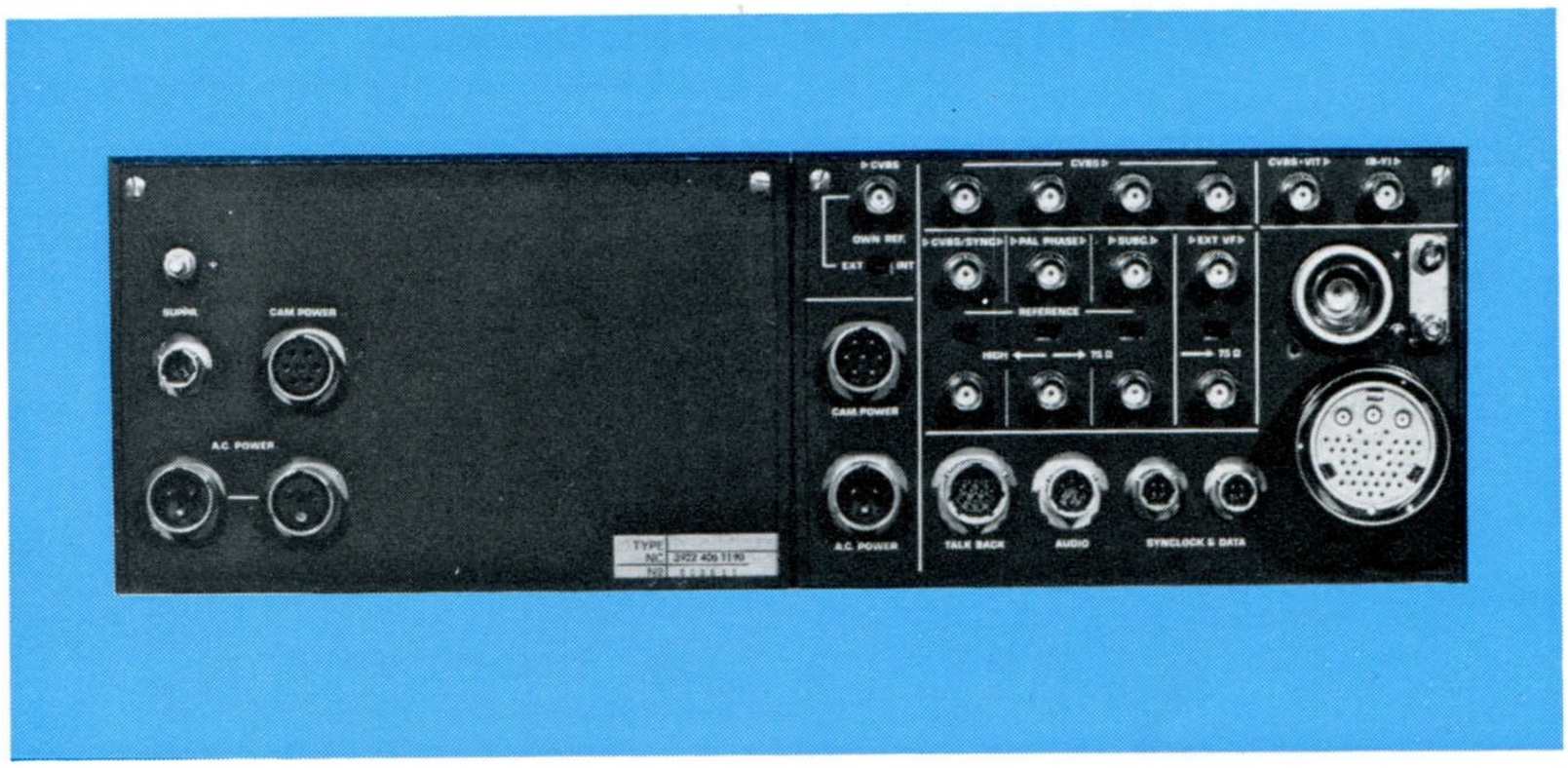
The first video pre-amplifier stage in each camera channel is mounted inside the mu-metal screen of the deflection coil assembly, as near as possible to the signal electrode, for minimum capacitance and pick-up of spurious signals. The video processing amplifier channels include contour correction, linear matrixing and gamma correction.

Apart from the normal intercom channels for engineering and production talk-back and programme sound, two audio channels are available between camera and base station, for commentator microphones or other uses. Camera and viewfinder operate on a 100 V d.c. line voltage from the base station.



Reception Unit LDK 4300 and Camera Power Supply Unit LDK 4315 in 19-in rack holder. Front and rear view.





Sync-lock Unit LDK 4322.

THE BASE STATION

The base station is split up into four sections: reception unit, sync-lock unit, surveillance unit, and camera power supply unit. The reception, surveillance and camera power supply units are of half 19-inch width, the sync-lock unit being a module that can be plugged into either the reception unit or, together with the sync-lock modules of three other base stations, into an optional unit to be arranged in any place where the camera signals should be in time-coincidence with the studio reference.

The above three units are self-contained as far as supplies are concerned. They are interconnected by cables through the reception unit. Each unit consists of one or more modules plugged into a holder, which is devoid of wiring. All external and internal connectors and the intermediate wiring are mounted in an interconnection part at the rear of the module holder. Owing to this construction, the layout of one or more base stations within a rack space is very flexible and can, if necessary, easily be changed.

The reception unit contains a power supply module and three more modules with the electronic circuitry for video and audio demodulation and distribution. A fourth position is wired to take the sync-lock module containing the circuits for timing comparison of the camera signal with the studio reference. As studio reference, the sync-lock unit accepts either separate sync, subcarrier and PAL reference signals or a video signal containing sync and subcarrier burst.

The surveillance unit contains only one module with the base station part of the digital control circuitry, the camera operational controls being arranged on the module front panel. Remote operational units can be connected to this surveillance unit.

The digital system controls 16 analog and 32 switching functions. There is only data transmission from base station to camera when a control setting is changed. Although the data are normally transmitted over the triaxial cable, time division multiplexing has been employed to enable the transmission of the control data of up to four camera chains over a single data link, which may be formed by a two-wire connection, or HF transmitter and receiver link. With the aid of standard modems (modular-demodulator units used by the post and telegraph services), transmission is also possible over the switched telephone network.

The accuracy of the analog functions is 8 bits, corresponding to 256 discrete control levels. The control data for a total of four cameras is transmitted in 45 ms. The camera employs a digital memory in which the control commands are stored. This memory is a 128 bits read/write random access MOS memory, which needs only 1 μW/bit stand-by power to be kept alive.

This power is supplied by a rechargeable nickel cadmium cell. In this way, the memory is kept alive even when the camera chain is switched off for prolonged periods of time. This means that the control settings will be retained when the camera is switched off for the night or week-end, or when it is switched over to another base station.

The camera power supply unit houses two modules, one containing the driving and control circuitry, the other the mains rectifying circuitry. This unit supplies the 100 V line voltage on which the camera and viewfinder operate. This voltage is kept accurate within ±1%, measured at the camera, by means of a