

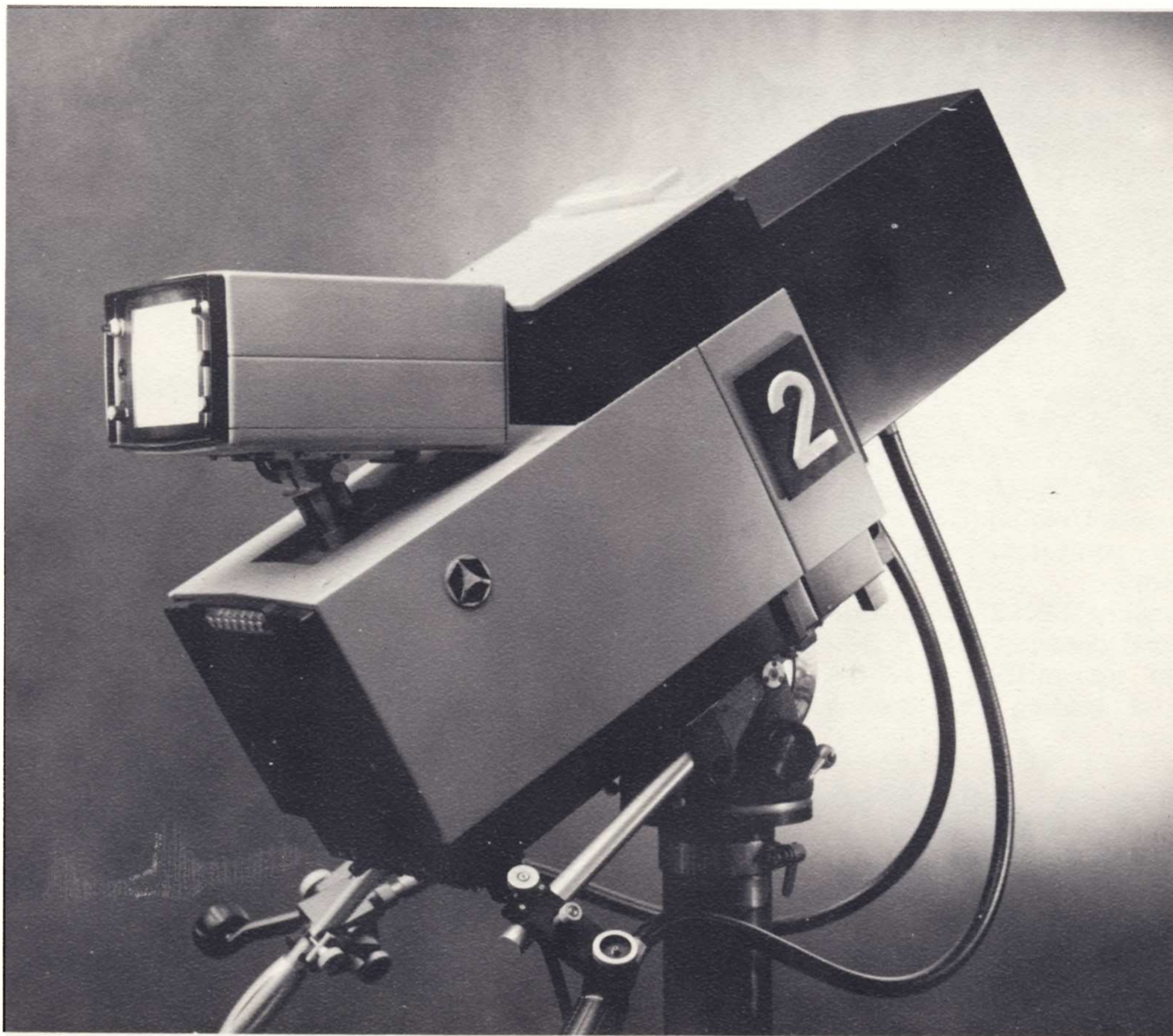


THOMSON-CSF

TTV1515

COLOUR CAMERA CHANNEL

single coaxial camera cable, extensive integration and microminiaturization, automatic and continuous registration



CAMERA (excluding viewfinder and zoom lens)

Dimensions : Height : 440 mm
Width : 280 mm
Depth : 530 mm

Weight : 35 kg.

FEATURES

- Three 30mm PLUMBICON* Tubes with separate mesh.
- Wide choice of camera cables :
 - single coaxial cable, up to 2000 m operation, because of the use of an integral multiplex system.
 - or multiconductors : conventional cable used on former cameras or new small diameter cable.
- Automatic and continuous registration control**.
- Contour correction and comb filter**.
- Built-in colour masking.
 - 2 interchangeable versions : fixed or adjustable.
- Automatic sync. facilities** with phase advance of video output signals, horizontally and vertically adjustable, from:
 - positive or negative going mixed sync. signal (with automatically switched polarity).
 - composite video signal.
 - unipulse "SBU 1" (Signal de Base Unique) (ORTF system equivalent to peak white).
 - possibly "SBU 2", with additional decoder (ORTF System transmitting only the pulse leading and trailing edges).
- Automatic cable length compensation between 0 and 2000 m of single coaxial.
- Beam splitter with optical relay lens system and built-in diascope, bias light source, automatic registration optical reference mark system.
- External, independent, interchangeable zoom lens package.
- Standard : 625 lines or 525

lines equally.

- R.G.B. outputs enabling colour coding in all existing systems : SECAM, PAL, NTSC.
- Reduced size, lightweight, low power consumption.
- Straightforward mechanical design and easy accessibility to all circuits.
- Extensive use of silicon semi-conductors, thick layer hybrid integrated circuits and monolithic integrated circuits.

NOTE :

* Registered Trade Mark for television camera tubes PHILIPS Gloeilampenfabrieken.

** THOMSON-CSF Patents.

USE

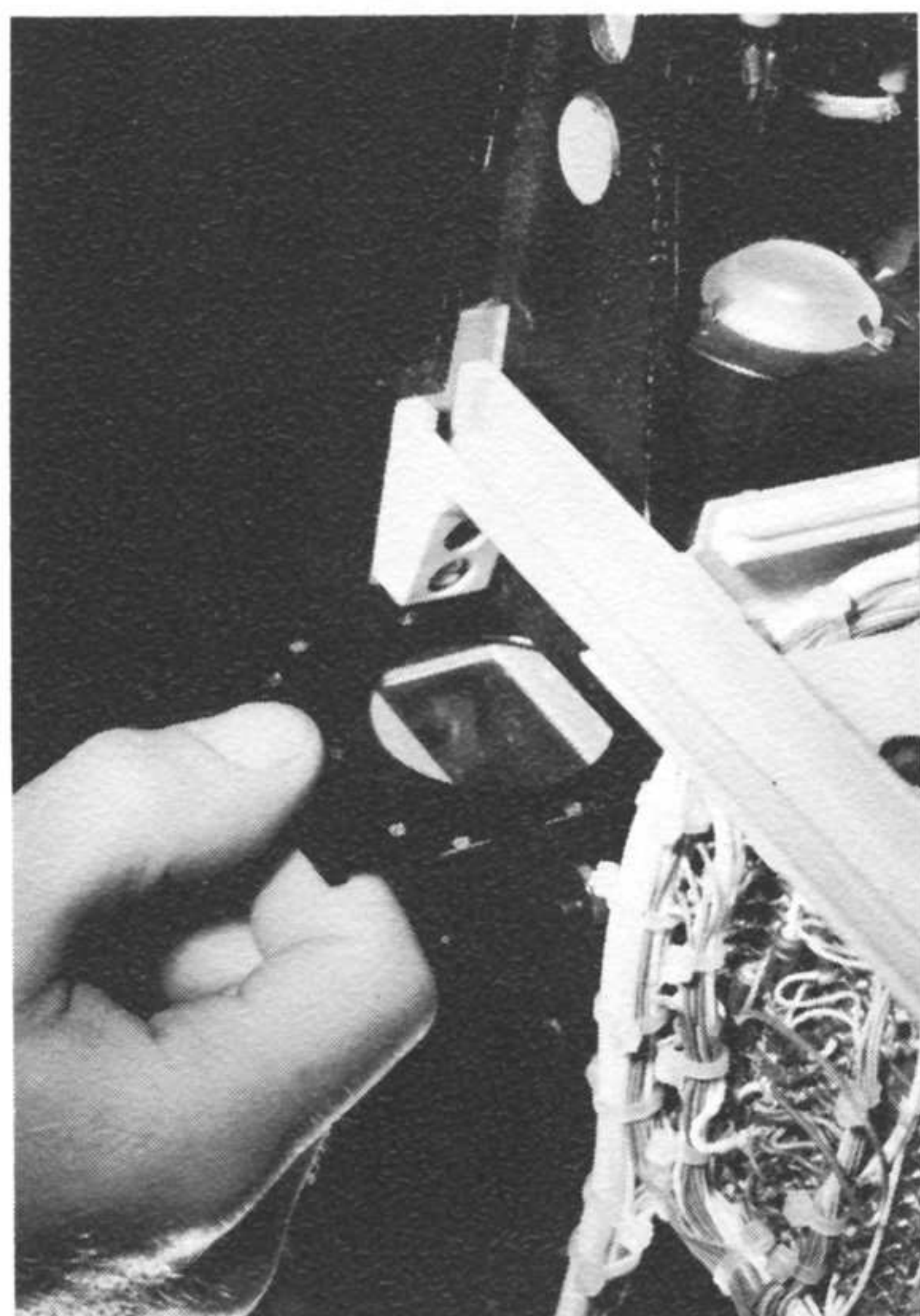
The new colour camera channel **TTV 1515**, the latest of THOMSON-CSF products is of an entirely new type.

— Because of its technical and technological advance (new THOMSON-CSF patented circuits, extensive use of integrated circuits) it ranks first among the present colour television cameras.

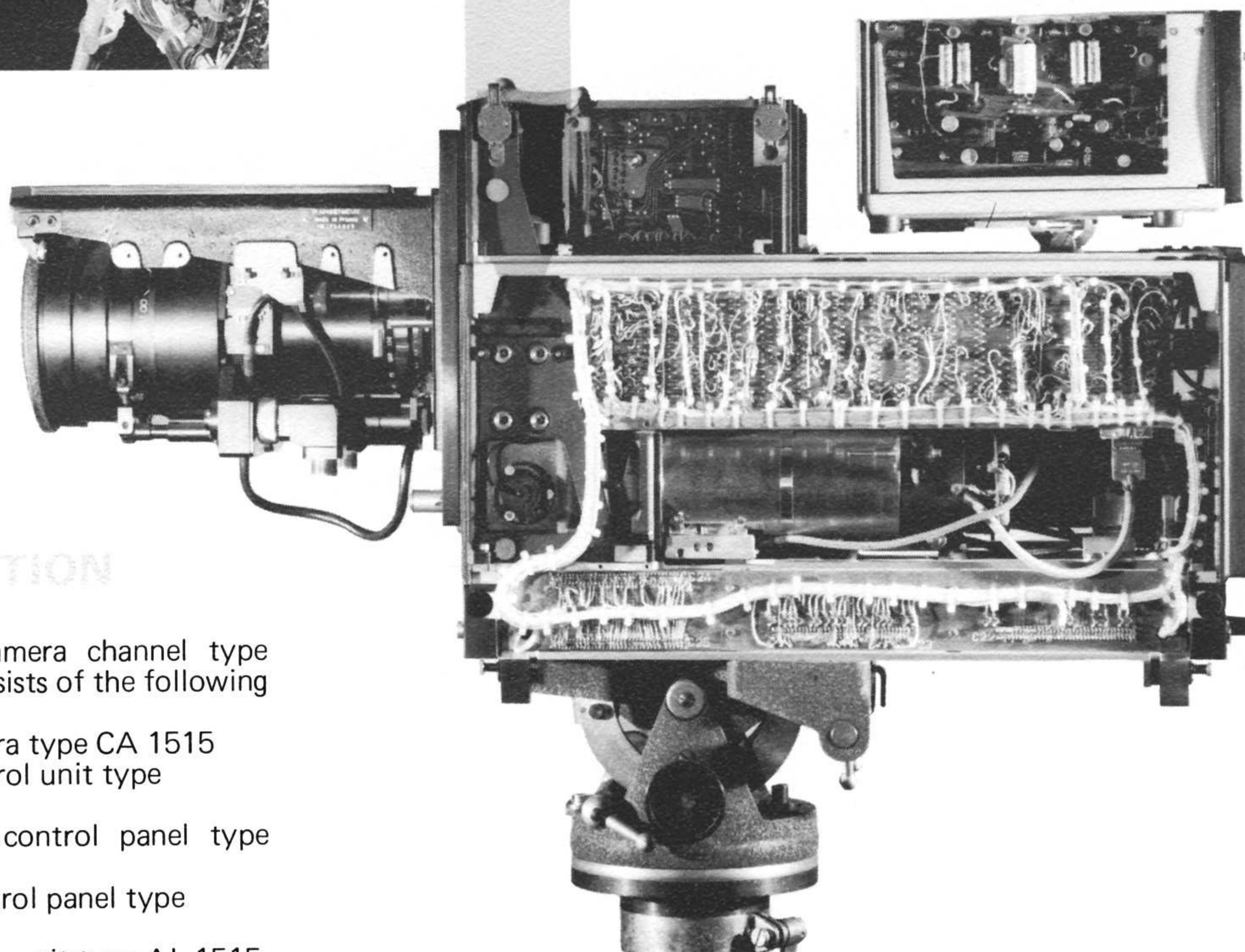
— Because of its outstanding operational capabilities the high performance **TTV 1515** colour camera channel is perfectly suited for television studios producing quality programmes.

Its well designed operational capabilities, reduced size, lightweight low power consumption, operation with up to 2000 m of single coaxial cable make the **TTV 1515** camera highly suitable for outside broadcast use with increased self operational capabilities with respect to the presently used equipments.





Easily accessible diascope
Standard types of 5 cm x 5 cm slides can be used



DESCRIPTION

The colour camera channel type **TTV 1515** consists of the following basic units :

- Colour camera type CA 1515
- Camera control unit type CV 1515
- Operational control panel type PR 1515
- Remote control panel type PT 1515
- Power supply unit type AL 1515.
- Camera cable type CC 1515.

A - CAMERA

It consists of three fully independent sub-assemblies :

- Camera body
- Lens
- Viewfinder.

1 - Camera body

The camera body is built around the beam splitter cast frame on which are fitted in a rigid manner first the lens and then the three yokes of the pick-up tubes.

The three pick-up tubes are arranged physically to be **parallel** in a horizontal plane which in turn is also parallel to the camera optical axis; such arrangement enables the adverse influence of magnetic fields to be minimized.

The pulse (CCU remote control to camera) and RF (camera information to CCU and CCU to camera) **multiplex assembly** is housed in a 6 cm high self-operational unit located in the camera lower part. This sub-assembly comprising 2 "pulse" and 1 "RF" plug-in printed circuit boards can be replaced by a conventional cable matching circuits and connector, when the multiplex system is not used.

The R, ψ , B board is also built into this unit, but on a permanent basis. The **scanning, automatic registration, pick-up tubes auxiliary circuits assembly** comprises about fifteen printed **boards** housed in a single frame at the camera centre.

All registration presettings are ac-

cessible from the camera centre. Integrated video preamplifiers are fixed on the yokes assemblies. The upper part of the camera body houses the power supply assembly : 130 V DC converter/80 V/18 V/12 V/6 V and low voltage stabilizing units.

An interesting option is proposed, enabling to use multiconductor cables : conventional type or new type of small diameter.

The 3 multiplex boards can be

replaced by a single board bearing a conventional camera cable plug (coaxials and conductors).

Fitted on front of the camera in the **beam splitter** consisting of an optical relay system and dichroic mirrors, which is the only solution enabling to incorporate in its very casting the diascope, the optical reference mark system, the bias light source.

The diascope is in the form of a slide carrier providing ease of access and enabling to use any standard 5 cm x 5 cm colour slide. It can be operated by a simple switch from the control panel.

Zoom lens mounts externally on the beam splitter cast frame with **quick change mount**.

2 — Lens

Two options :

- **Focal length ratio : 1 - 15**

fixed lens assembly comprising a 4 position range extender turret (increasing the focal length range by factors of 1.5 - 2 and 2.5).

- **Focal length ratio : 1 - 10**

Lens assembly sliding on runners which enables to insert the 3-range extenders (1.5 - 2 and 2.5).

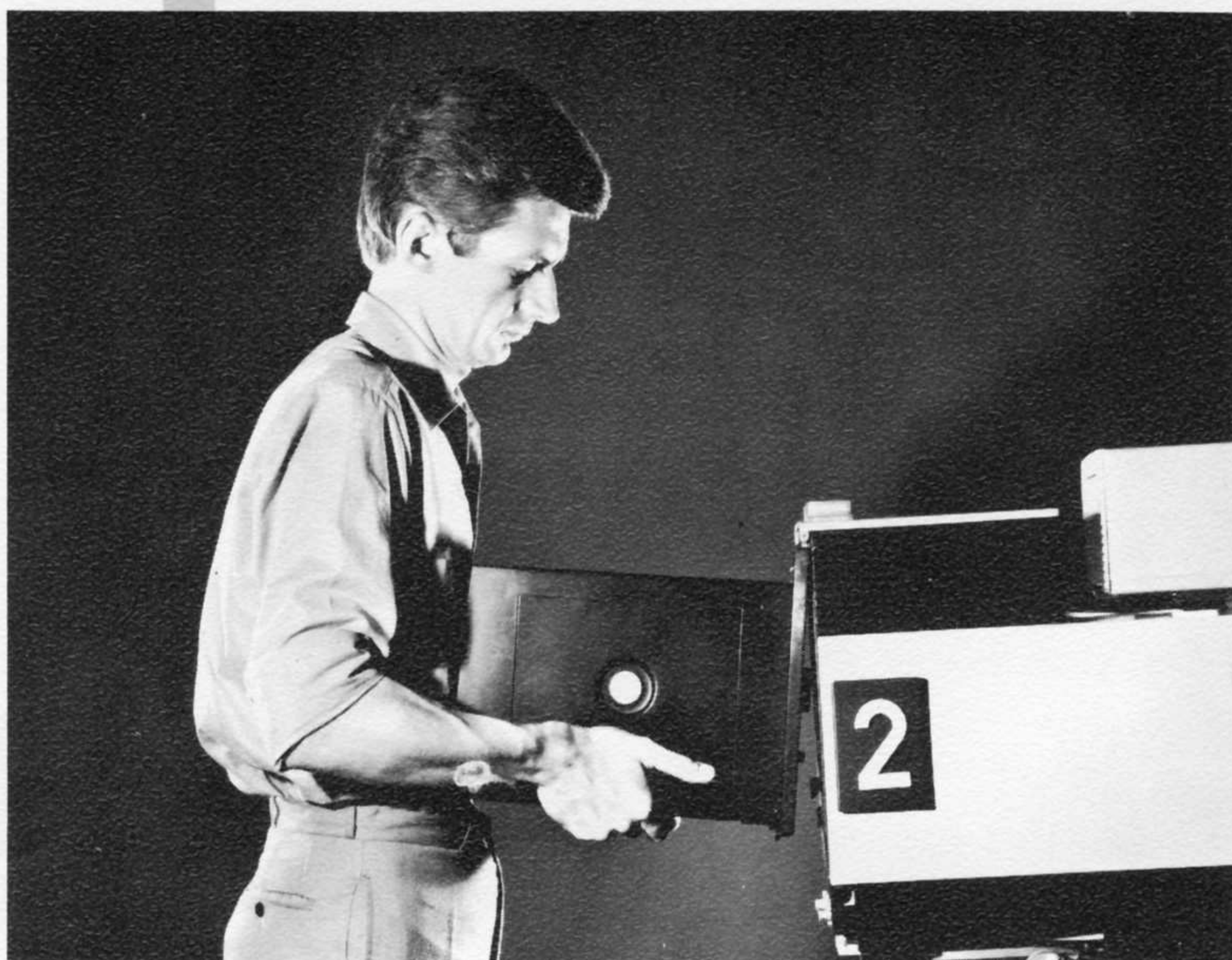
Iris control is always performed by servo drive unit. Focus, focal length and turret controls can be either servo or manual.

Control handles are separate from the camera body and mounted on the camera panning handles secured to the pan and tilt head.

In its **manual version**, control handles are directly coupled through mechanical cables to the two mechanical drive outlets of the zoom lens.

In its **servo version**, they are coupled through two electrical cables to the servo drive units which are directly fitted on the zoom lens mechanical drive outlets. These servo motors are fed through two amplifiers accommodated in the same housing.

Use of any type of television zoom lens and quick interchangeability of zoom lens packages.



3 — Viewfinder

This unit forms a **self-contained tilting and swivelling** sub-assembly of the plug-in type. It is worth noticing that the viewfinder may be detached and operated away from the camera over an extension cable. It is fitted with a 17 cm diagonal high resolution tube with a high-light brightness better than 600 nits - 200 foot Lamberts, specially designed for this camera. High voltage is fed by a 14 kV regulated power supply.

An electronic display indicator system enables to show on the viewfinder screen the focal length of the camera lens.

This viewfinder can be fed, by means of a switch fitted inside the camera, with the three R, ψ , B video outputs of the camera, or through external push-button switching, with the R, G, B, Y video outputs of the camera control unit, the B-G and R-G differences or an external signal.



Electronic display indicator system of the viewfinder

B - CAMERA CONTROL UNIT

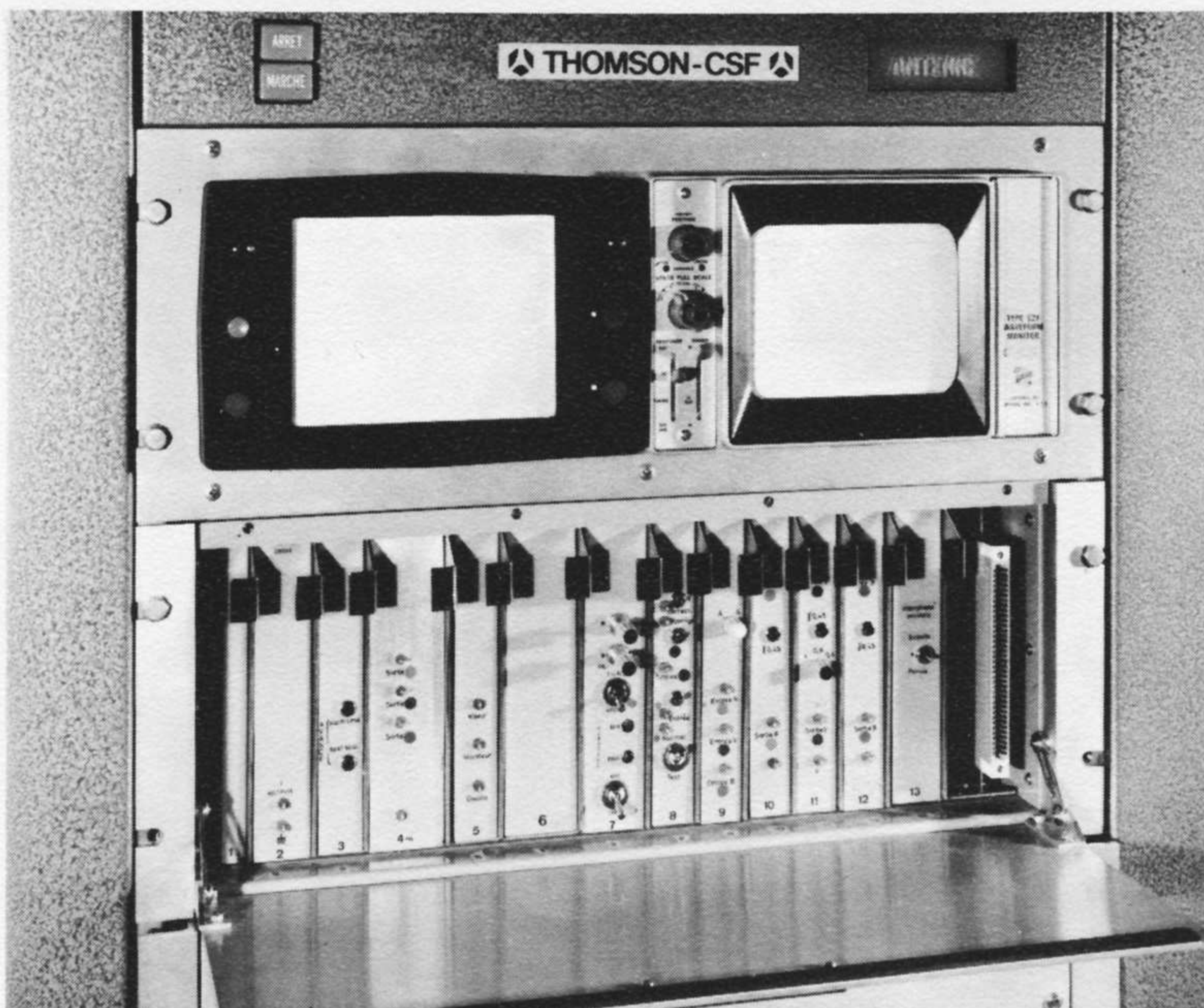
The camera control unit, which is 4 units high, is designed for standard 19 inch rack or cabinet mounting. The front cover hinges down giving access to the various plug-in printed circuit boards. All connections of the incoming and outgoing signals are taken from the rear panel mounted connectors.

This camera control unit embodies a number of circuits which are not currently provided, such as :

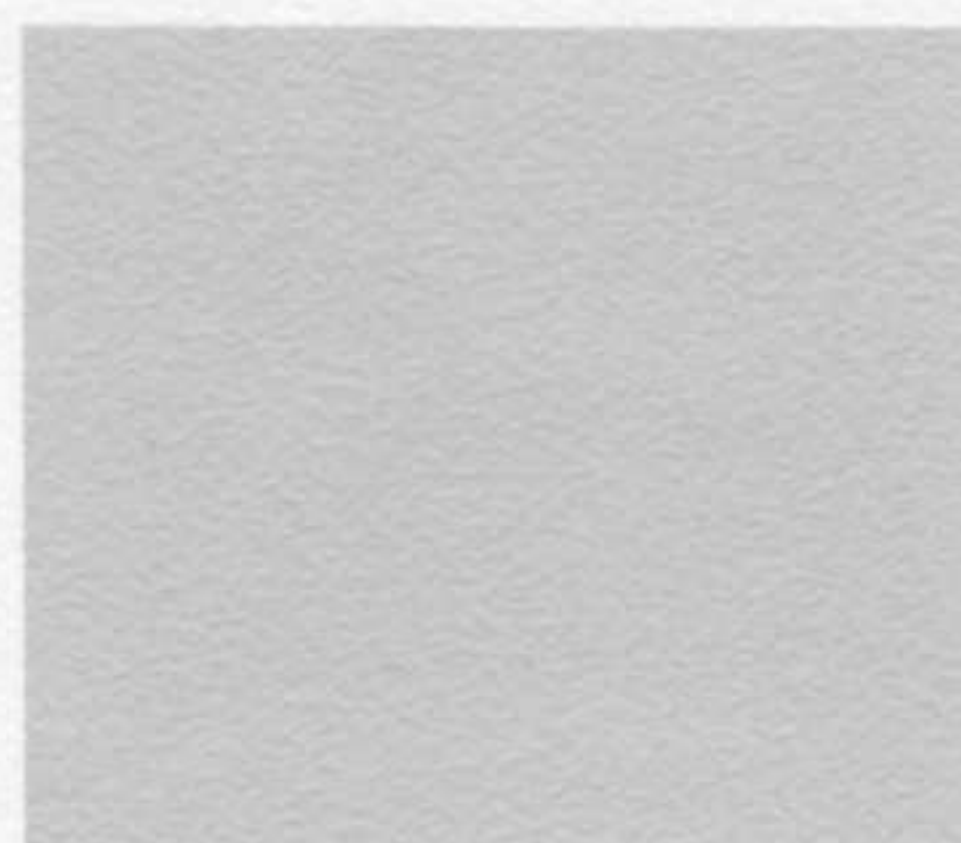
- colour masking
- contour enhancer
- comb filter
- multiplex.

The multiplex assembly enables to use the single cable. Optionally (multiconductors cables), the multiplex circuits are replaced by a manually controlled cable equalizer.

The pulse generating unit (**real miniature sync. generator**) makes possible to restore from the mixed sync, signal **only** all the signals such as blanking, drive signals etc... usually delivered from an external sync. generator. The circuit also enables **automatic phasing** of the CCU and the camera for any length of cable between 0 and 2000 m, as well as, phasing of the video signals supplied to compensate for any possible delay occurring in the studio equipments : encoders, video distribution amplifiers, video switcher-mixers or else.



View of Camera Control Unit.

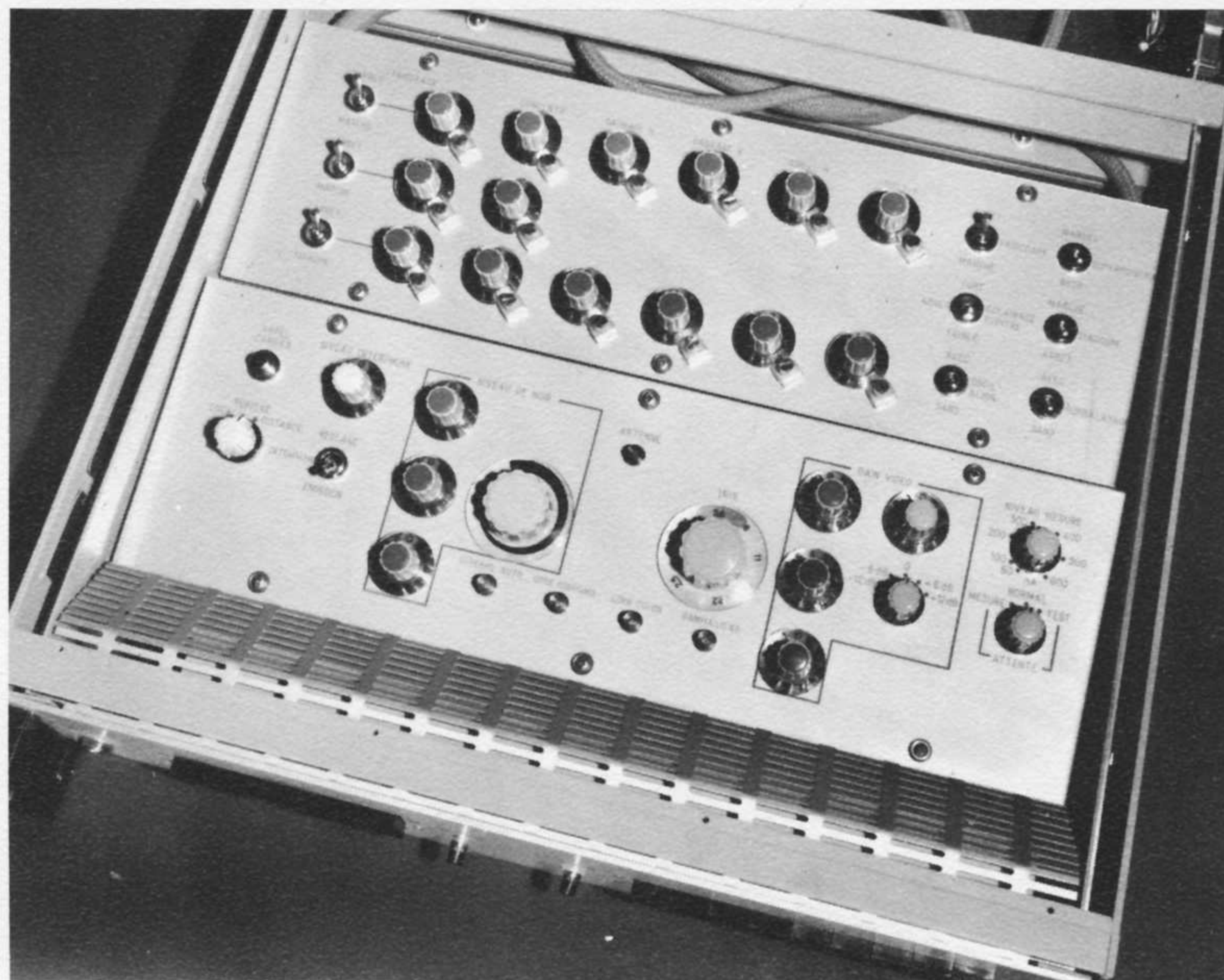


C - OPERATIONAL CONTROL PANEL

The operational control panel is a 2 units high **pull out drawer** designed to mount on runners in a 19 inch rack. It contains all the **controls** associated with registration setting and adjustment of the main operational functions of the camera. On the front of the panel are the preview switches for preselection of the picture on the picture and waveform monitors.

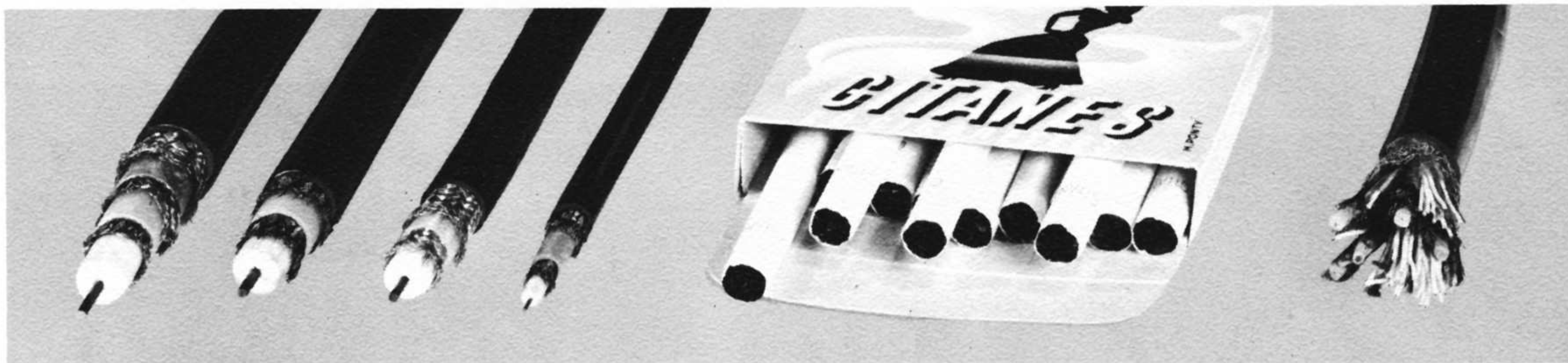
Other readily accessible controls are arranged on a luminous panel for ease of operation, even in a room with poor lighting.

Connections with the CCU are made from the rear panel by means of a cable which can reach up to ten meters.



D - REMOTE CONTROL PANEL

Separate from the previous one, it enables to operate from a remote position (up to 100 meters) some of the currently used operational controls, such as : iris, master black, master gain.....



The single coaxial cable.

E - POWER SUPPLY UNIT

It comes in the form of a 4 units high and half of a standard 19 inch rack mounting frame. It consists of :
 — CCU and camera power supply transformers,
 — CCU voltage stabilizing circuits,
 — Camera 130 V overload and short-circuit protective system.
 — Meter for currents and voltages reading.

F - CAMERA CABLE

This cable, which is simple but rugged, **small in diameter** and conse-

quently little cumbersome and lightweight, enables camera operation up to 2000 m, because of the use of a **multiplex assembly, pulse** operated for camera remote controls and RF operated for video signals carried both ways.

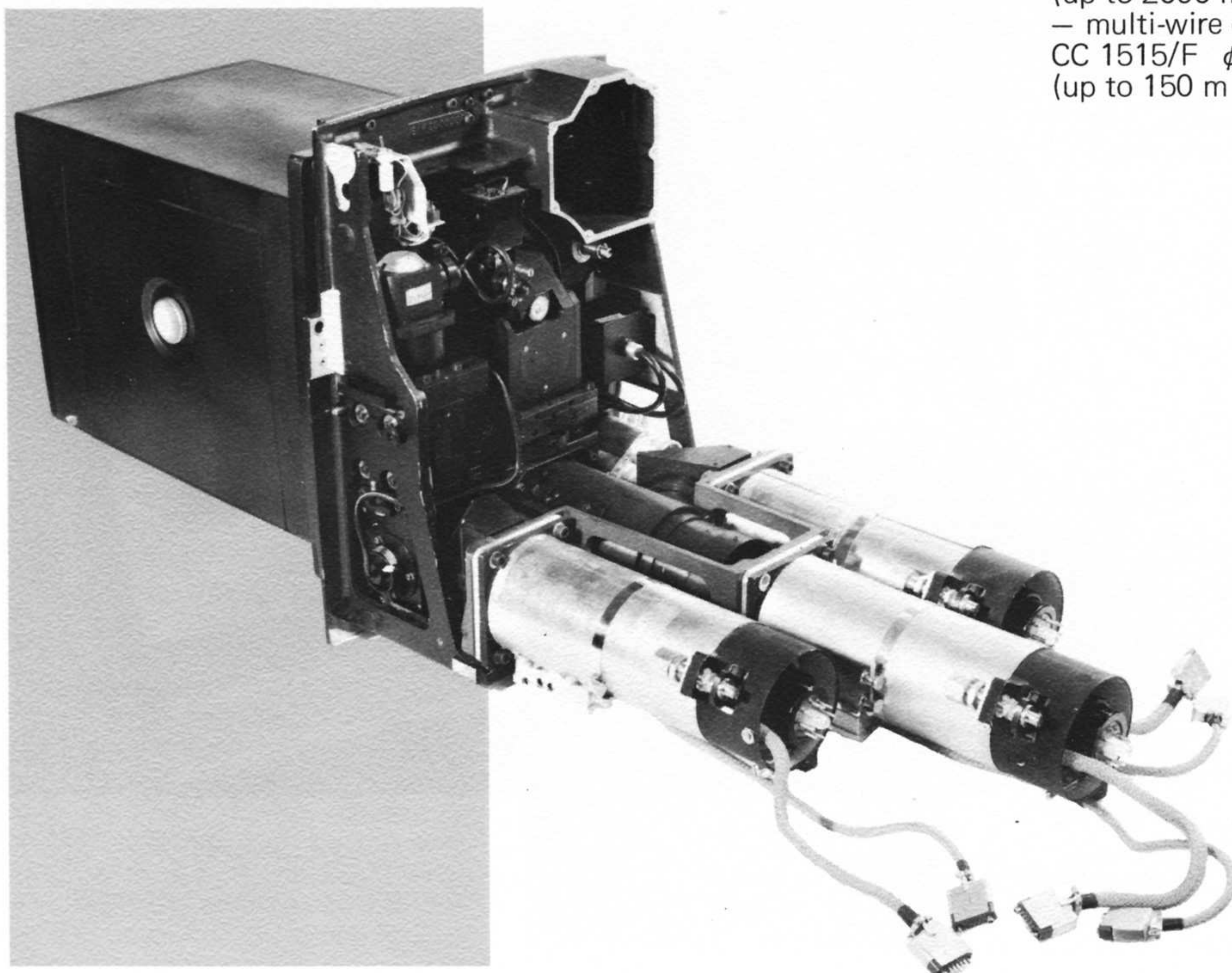
Nevertheless, should the standard solution be preferred, provision is made for optional use of a multi-conductor camera cable (large or small diameter) by replacing the multiplex terminating circuits on the camera side and on the CCU side by multiconductor cable matching circuits.

DATA SUMMARY

A - GENERAL

- Three 30 mm PLUMBICON* tubes with separate mesh.
 - red channel : XQ 1025 R
 - green channel : XQ 1020 L
 - blue channel : XQ 1020 B
- Scanning standards :
 - 625 lines, 50 fields/second.
 - 525 lines, 60 fields/second
- Operating temperature range :
 - ambient temperature : -10°C to $+50^{\circ}\text{C}$.
- Two-way camera-channel intercom system (ability to operate even with mains off).
- Camera cables :
 - coaxial :
 - CC 1515/A ϕ 8 mm (up to 500 m max.)
 - CC 1515/B ϕ 12 mm (up to 1000 m max.)
 - CC 1515/C ϕ 16 mm (up to 1500 m max.)
 - CC 1515/D ϕ 20 mm (up to 2000 m max.)
 - multi-wire cable :
 - CC 1515/F ϕ 14 mm (up to 150 m max.)

Optical assembly and pick-up tubes



B - OPTICAL AND COLORIMETRIC

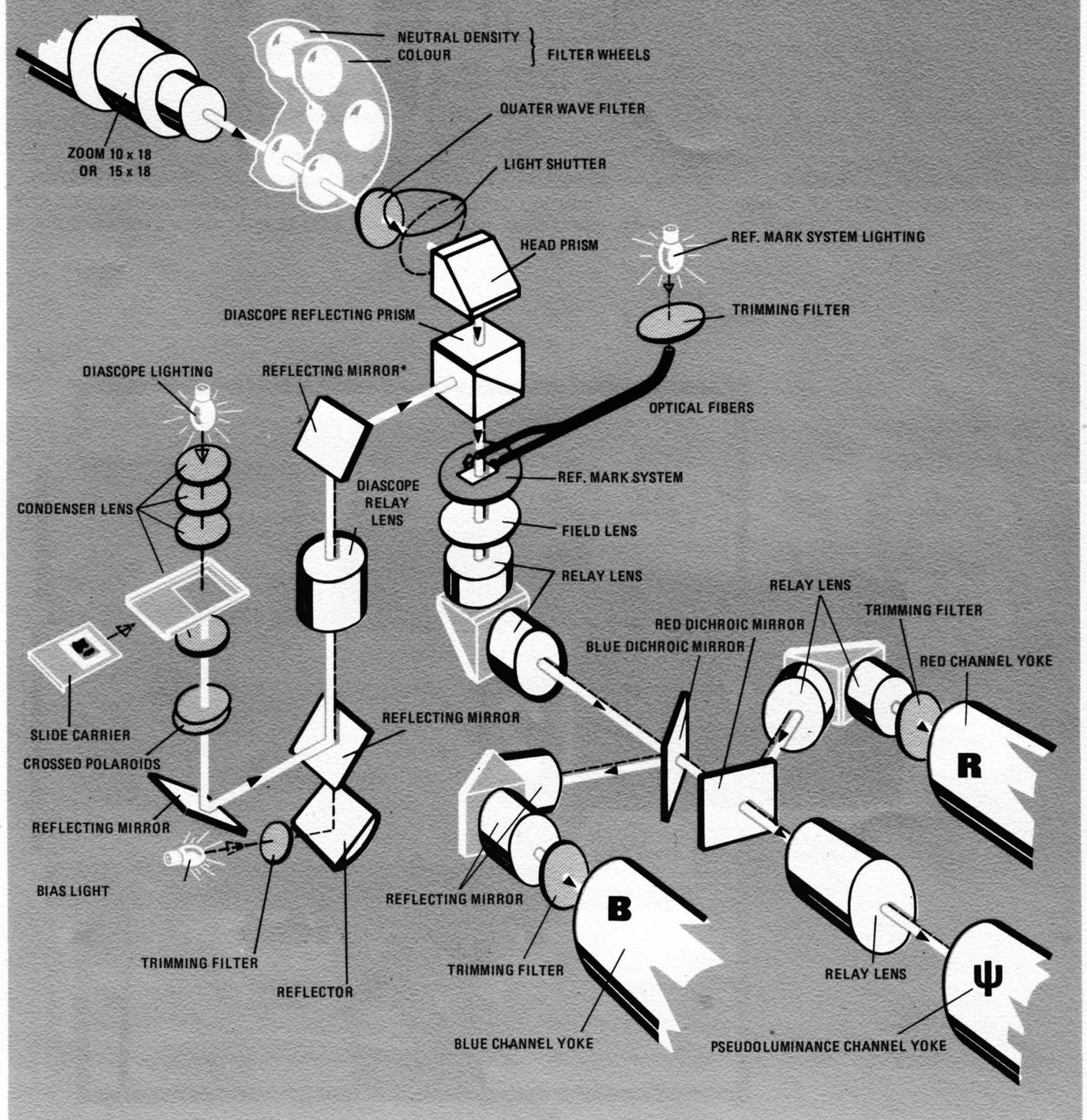
- ANGENIEUX 15 x 18 L 91 zoom lens, max. aperture f/2.4, up to 10 times and between f/2.4 and f/3.5 from 10 to 15 times. 4-position range extender turret either **servo** or **manual** drive mechanisms. Min. focusing distance : 0,55 m.
- ANGENIEUX 10 x 18 L 41 zoom lens, max. aperture f/2.5 (either servo or manual controls). Min.

focusing distance : 0,90 m (provision is made for manual insertion of range extenders, increasing the focal length range by factors of 1.5 - 2 and 2.5).

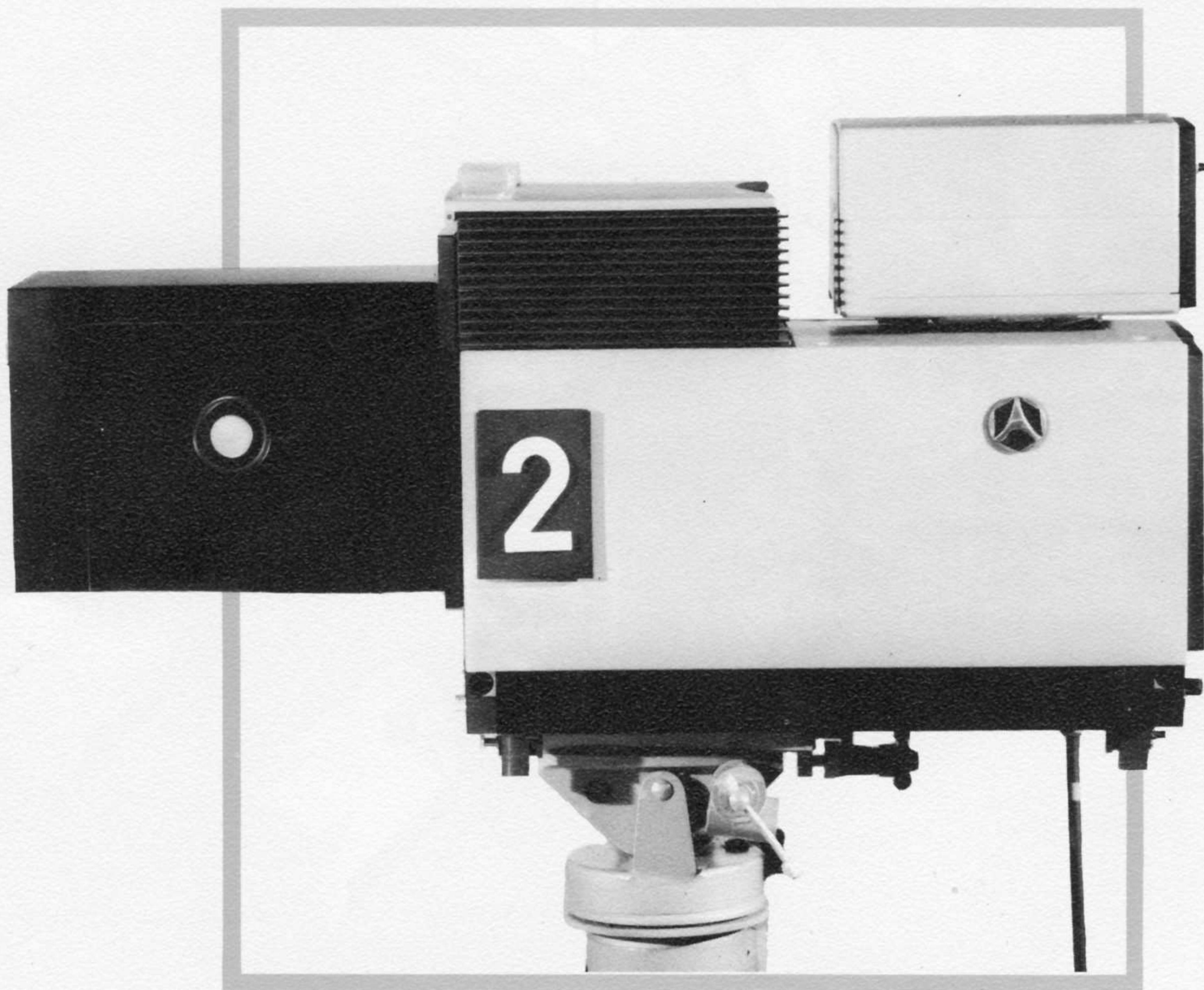
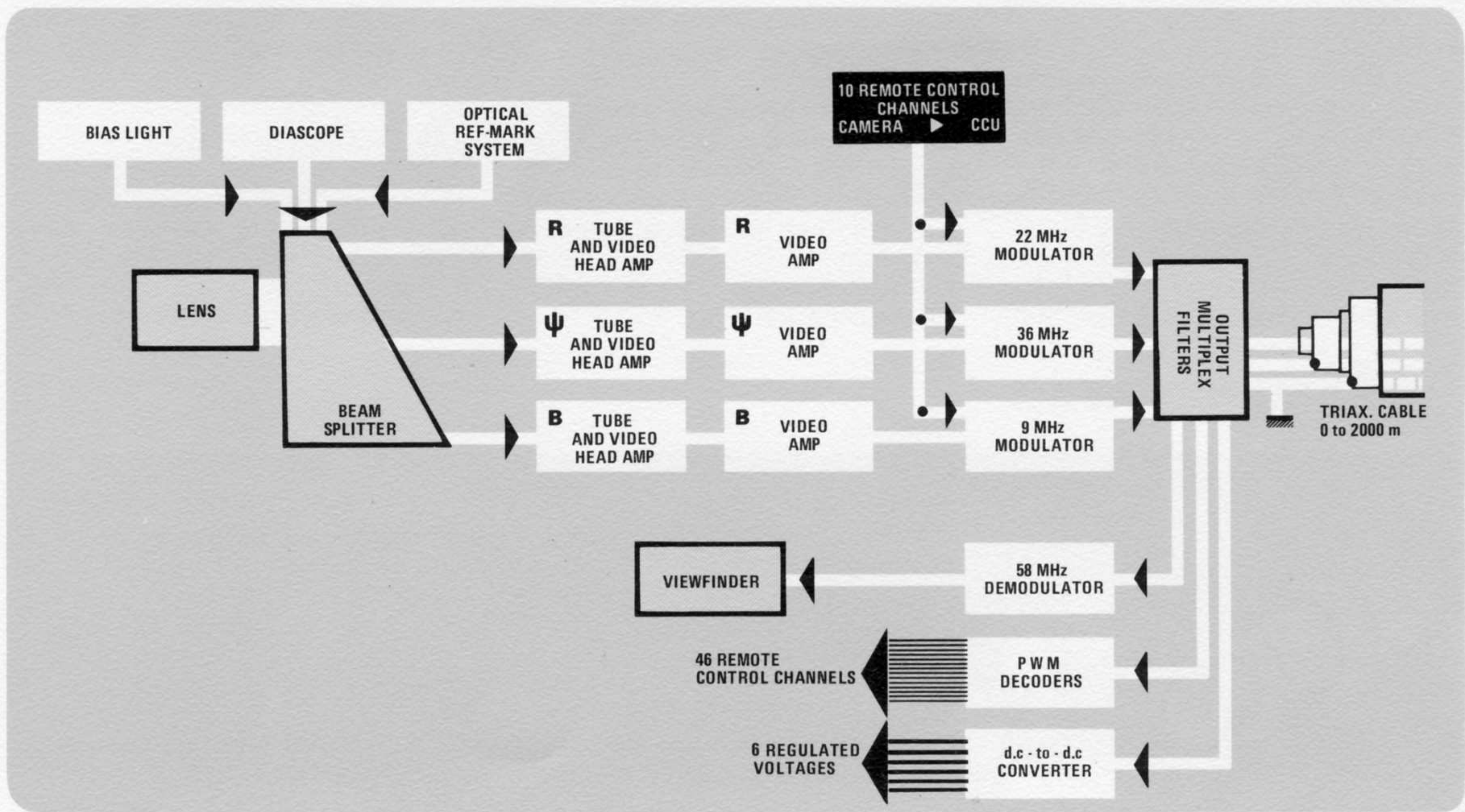
- Or, on request, **any other types of zoom lenses**, designed for 30 mm pick-up tube format usually employed on colour television cameras, provided that back focal length be ≥ 49 mm.
- Any standard 5 cm x 5 cm slides for diascope scanning.

- Automatic mechanical protection system for the pick-up tubes. Two mechanically controlled filter wheels, containing four colour filters each.
- **Permanent** filter providing immunity to polarized light effects.
- Colour masking through fixed factors linear matrixing (option : adjustable factors non linear matrixing - 6 tones - 6 saturations).
- Beam splitter with optical relay system and dichroic mirrors.

BEAM SPLITTER TYPE TTV1515



CAMERA BLOCK DIAGRAM



C - ELECTRICAL

- Power input : 127 or 220 V \pm 10%, 50 or 60 Hz. single phase.
- Consumption : 250 VA approx.
 - camera : 150 VA.
 - CCU : 100 VA.
- Pick-up tube accurate timing is measured by the camera built-in hourmeter.

D - VIDEO FREQUENCY

1) Resolution

Resolution at the camera output (with 5 MHz bandwidth)

- higher than 90% of the figure specified by the manufacturer of related tube. By way of example, for a tube guaranteed at 50% for 400 lines, the modulation depth measurement will not be less than or equal to 45% on a reference test pattern slide.

Dynamic focusing correction system improves resolution in the picture corners.

2) Sensitivity

With incident illumination at 3200°K, of 1000 lux on a white chip of 60%

reflectance and lens iris at f/4 :

- signal to r.m.s. noise ratio \geq 46 dB and 48 dB typical
- signal to weighted noise ratio \geq 60 dB

should be obtained at the pseudoluminance channel output.

Measurement is carried out on a ROHDE & SCHWARZ noise meter, limiting the bandwidth between 100 kHz and 5 MHz, all contour and gamma corrections being eliminated, beam currents cut-off, and black level adjusted at 20% of peak white.

3) Lag

An auxiliary bias light system significantly reduces usual lag of PLUMBICON tubes at low lighting levels, thus enabling to produce acceptable pictures with incident illumination down to 100 lux (video gain + 12 dB.)

4) Pulse inputs

Positive or negative going mixed sync. signal (automatically switched polarity), or positive going composite video signal, or SBU 1 (signal de base unique) (possibly SBU 2 with additional decoder).

- horizontal scan phase advance :

0 to 5 μ s/theoretical position.

- vertical scan phase advance : 8 to 13 μ s/theoretical position.

— Advance of related sync. for use with a local black and white picture monitor, available at auxiliary output.

5) Gamma corrector

The nominal gamma law is equal to 0.45 (or \pm 0.05 adjustable) other possible selection through switching 0.6 or 1.

6) Contour enhancer

- Horizontal and vertical transitions enhancement through omnidirectional contour correction obtained through 2 pairs of 64 μ s and 0.1 μ s delay lines.

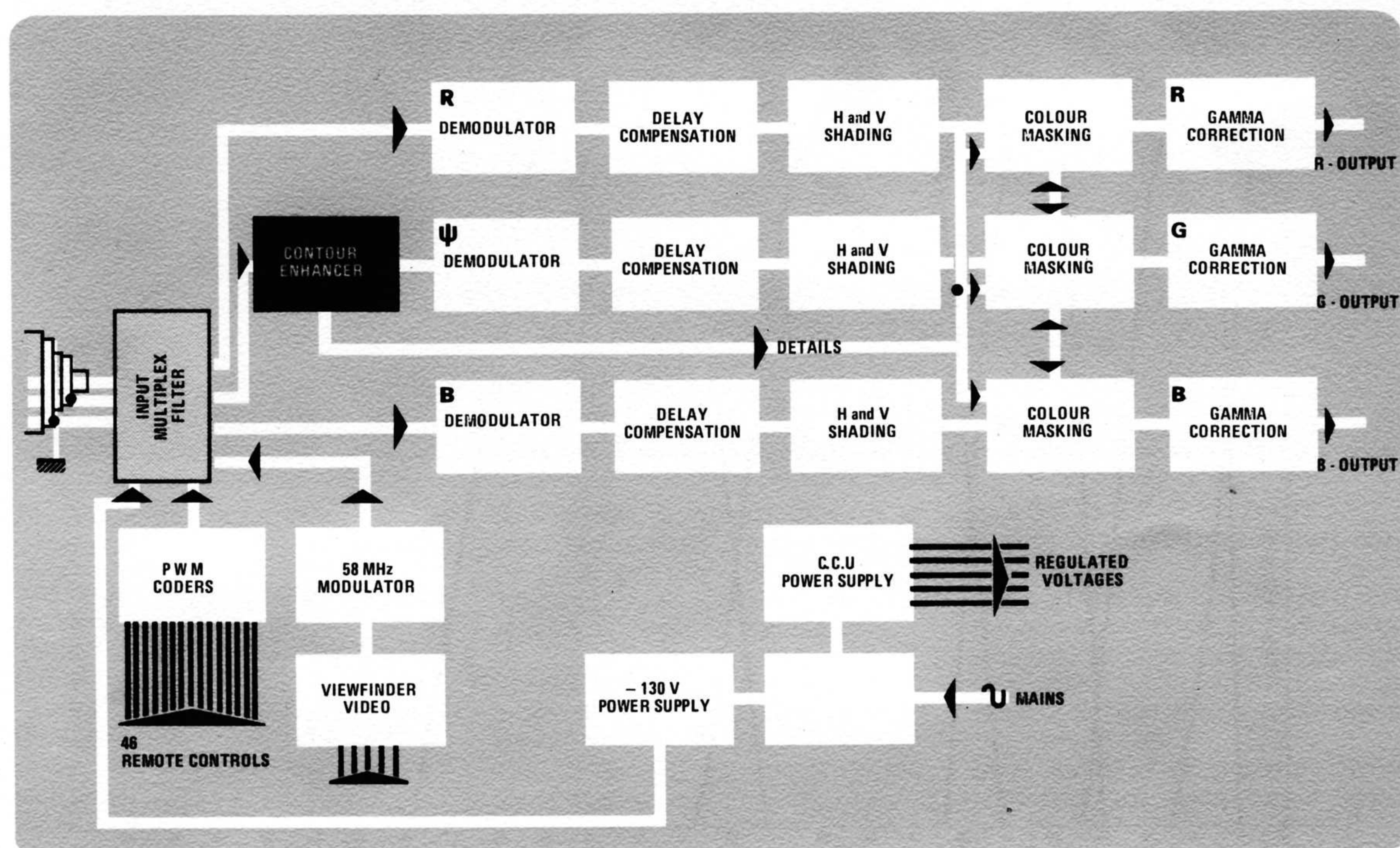
- Provision is made for picture noise reduction through comb filter and selective noise reduction in the correction signal.

- Noise reduction better than 3 dB for equal modulation depth.

- increase in horizontal resolution by 3 dB for equal noise level.
- in all cases, significant increase in vertical resolution.

- correction efficiency can be adjusted for 100% modulation depth at 5 MHz.

CAMERA CONTROL UNIT BLOCK DIAGRAM



7) Multiplex system for single coaxial

A 70 MHz bandwidth spectrum is transmitted between the core and the first sheath of the single coaxial. The second sheath is used only to keep equipotentiality between camera and CCU constant, (the coaxial cable comprising a second sheath is sometimes called a triaxial cable).

This spectrum of multiplexed information includes :

- between CCU and camera :
 - d.c power for the camera (—130V and 1 A)
 - 46 channels of pulse multiplexed information, i.e :
 - . 40 channels/200 Hz bandwidth
 - . 6 channels/2 kHz bandwidth.
- Pulse multiplexed overall bandwidth: 3 MHz.

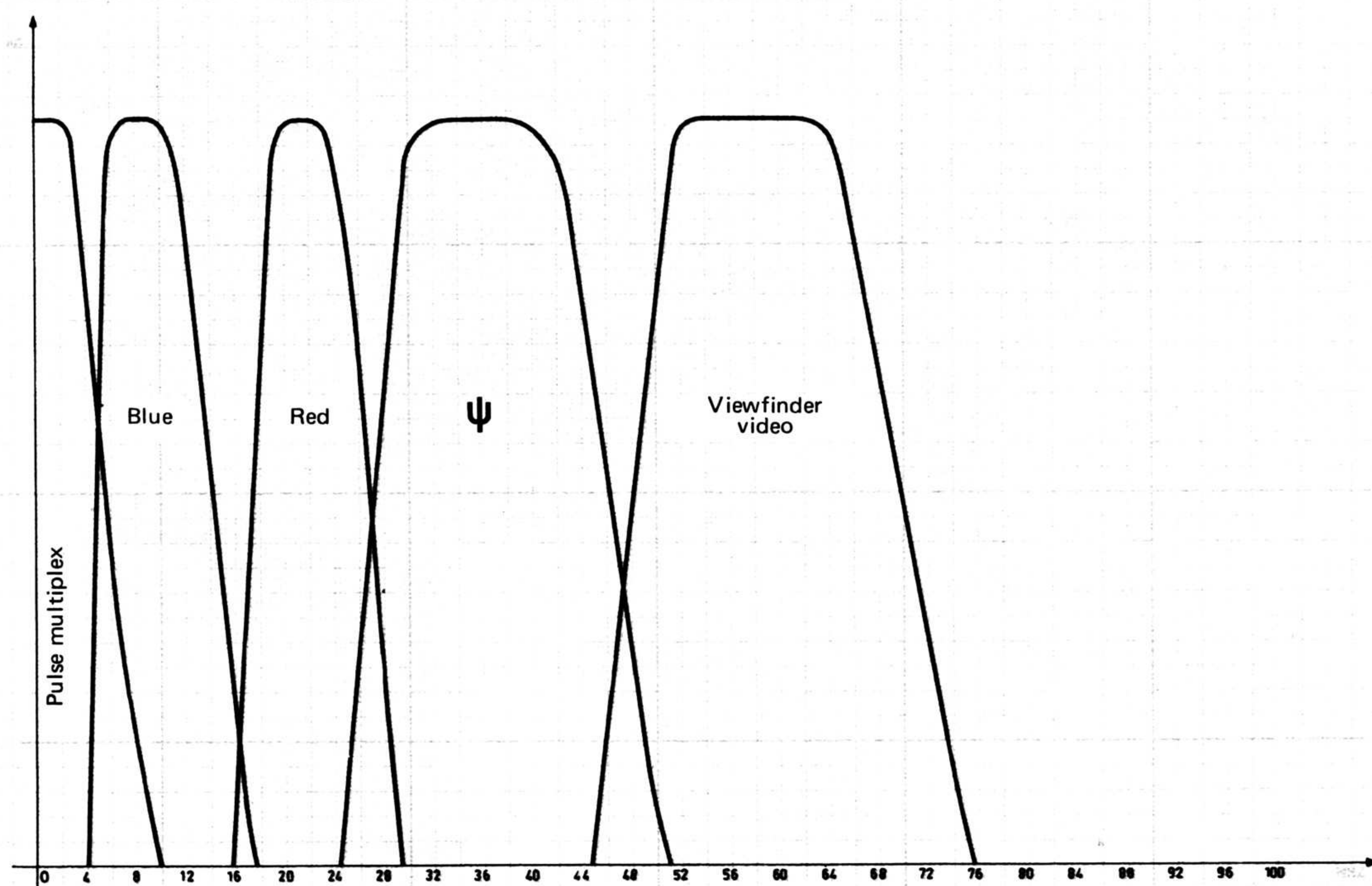
Duration of transmitted pulses : 2 to 14 μ s

- every 160 μ s in wide band
- every 1600 μ s in narrow band.
- a 58 MHz amplitude modulated carrier carrying external video or video output back to the viewfinder : video bandwidth 7 MHz at 3 dB.

- between camera and CCU :
 - three amplitude modulated carriers :

- . Video R 22 MHz - Video bandwidth 3 MHz at 3 dB,
- . Video G 36 MHz - Video bandwidth 6 MHz at 1 dB,
- . Video B 9 MHz - Video bandwidth 3 MHz at 3 dB.

Various engineering information transmitted during blanking periods of these three carriers.





8) Automatic registration control system

The three picture reference areas are defined as follows :

*area 1 : circle of diameter equal to 0.8 of picture height.

*area 2 : circle of diameter equal to picture width.

*area 3 : the 4 picture corners outside area 2.

0.1% of picture height corresponds to 40 ns in width and 0.6 line in height.

- Scan geometry distortion :
The scanned area of each one of the

3 channels is compared with an electronic grating generator and the resulting geometry distortion is as follows :

$\leq 0.5\%$ of height in area 1

$\leq 1\%$ of height in area 2

$\leq 2\%$ of height in area 3

provided that no distortion be brought in by the zoom lens (e.g : the 10 x 18 L 41 lens at 25 mm focal length).

- Registration of 3 scans :
— **without automatic control**, after optimum adjustment :
area 1 $\leq 0.05\%$ of the height
area 2 $\leq 0.1\%$ of the height

area 3 $\leq 0.4\%$ of the height
— **with automatic registration control** :

keeps in the long run, within 0.05% the above mentioned specifications, whatever the thermal or mechanical shocks and whatever the mains variations (within the specified operating ranges).

9) H and V shading compensation

Uniformity of video output signals can be adjusted in each one of the R, G, and B channels by means of positive or negative going parabola or sawtooth correction signals at H or V frequency.

E - VIEWFINDER

- Removable
- Rotating capability over $\pm 90^\circ$ range. Tilting capability over $\pm 30^\circ$ range.
- 17 cm diagonal tube.
- Regulated EHT : 14 kV.
- Highlight brightness : 600 nits (or 200 foot Lambert).
- Video input signals :
 - R, ψ , B from camera
 - R, G, B, Y, R-G, B-G from channel
 - or external video.



Rotated viewfinder and hinged down camera cover provide ease of access for servicing.

Basic Units	Height mm	Width mm	Depth mm	Weight kg
Camera type CA 1515 (excluding lens and viewfinder)	440	280	530	35
Lens type OB 1515 10 x 18 L 41	220	210	330	15
Lens type OB 1516 15 x 18 L 91	220	210	390	17
Viewfinder type VE 1515	140	220	260	5
Camera control unit ■ type CV 1515	178	481	520	10
Operational control panel ■ type PR 1515	88.6	481	520	7
Remote control panel PT 1515	190	115	370	2
Power supply unit ■ type AL 1515	178	210	480	14

■ In its standard 19 inch rack mounting version
Types CV 1515, PR 1515 and AL 1515 are also suitable for table case mounting.

The main care of the THOMSON-CSF Company being the constant improvement of its products, the right is reserved to change specifications and designs without notice.



DIVISION RADIODIFFUSION-TELEVISION
DIRECTION COMMERCIALE

100 RUE DU FOSSE-BLANC-92-GENNEVILLIERS-FRANCE- TEL: 793. 57.00 – TELEX: THOM-DRT-62.573-F-