

**Marconi**



# Mark IXB Colour Camera





# Mark IXB Colour Camera

## The Industry Standard in Colour Cameras

### Features

- Microprocessor control
- Lightweight compact camera
- Sensitive (pictures to 50 lux)
- Low power consumption
- Small CCU (integral P.S.U. and coder)
- Optional automatics
- Wide range of lenses (10:1 to 42:1)
- Dynamic gain (auto and manual)
- Lightweight multicore camera cable
- Two line aperture corrector
- Two programme microphone circuits option
- Field proven prism optics
- Tilting viewfinder ( $\pm 60^\circ$ )
- Automatic Beam Reserve with regular tubes OR Highlight Overload Protection tubes option
- Extended red tubes option
- Local or remote control
- Well balanced camera

### Facilities

- Variable gamma
- Two filter wheels
- High quality talkback system
- Shading compensation
- Individually variable light bias
- Auto iris and auto black
- Plug-in P.C.Bs
- Comprehensive monitoring
- Mechanical focus with positive end stops
- Automatic cable compensation (P.S.U. timing and viewfinder)
- H & V scan protection on all tubes (LED verification)
- Comprehensive cameraman's controls
- Script board holder
- Chroma key output
- Tube hour meter
- Camera mounted shot box
- Internal sawtooth/staircase test generator

### Introduction

Marconi has been involved in the design and production of television cameras since the late 1940s with the debut of the Mark I camera. Since that date over 3,000 cameras have been sold to more than fifty countries.

The first production colour camera was the four tube Mark VII which is still in service today. In 1971 the Mark VIII automatic camera was introduced combining light weight with many innovative features, and this camera won major awards for engineering design. In 1978 Marconi introduced the Mark IX colour camera. This latest fully automatic version reflected the experience gained after many years with this type of system. Marconi is now proud to offer the Mark IXB, a further step in the evolution of colour cameras involving the latest technology. A feature of the Mark IXB system is that a dedicated microprocessor controls the automatic registration sequence of each camera channel. This improves overall reliability and allows cameras to be used in stand-alone situations, using the optional Synchronizing Pulse Generator without loss of facilities.

This system of dedicated controls is unique to the Marconi Mark IXB and offers the user considerable flexibility as well as reliability assurance over and above other systems. The availability of dynamic horizontal and vertical centring, adds to this assurance.

A major advantage of the Mark IXB camera over most other colour cameras is the inclusion of a built-in diascope or test pattern. This in-built diascope enables the microprocessor control to optimize camera line-up without the use of external patterns either in front of or incorporated in the lens.

The extremely compact CCU includes all video circuitry, coder and power supply contained within a frame only 5 rack units high.



Compact self contained CCU and CCP.



# Camera Head

The camera body is constructed so that by simply removing eight screws the complete electronics frame can be removed from the optical assembly. This is mounted on a rugged cast base. When the viewfinder and lens have been removed the total weight is only about 30 kg (68 lb) enabling one man to carry it. Circuitry is contained on plug-in printed boards and extender boards are available for servicing. The pick-up tube yokes are fully screened and contain scanning coils printed in cylindrical form enabling an extremely high degree of accuracy to be achieved. A comprehensive talkback system is provided which is suitable for both European and U.S. systems. Headset jack sockets are fitted for both the cameraman and a floor manager. Two quality microphone circuits with individual level controls can be provided at the camera head for commentator and effects mics. Test input, monitoring outlet, and communications sockets are all provided on the camera base. The camera focus handle is situated at the right hand rear of the camera and drives the lens through a gear.



Shot box.

# Lenses

The camera can accept a wide range of lenses designed for the 30 mm pick-up tube format. These range from 10:1 to 42:1. Either manual or servo zooms can be provided.

An optional shot box with integral focus handle may be fitted to the rear of the right hand side of the camera in a position for comfortable operation by the cameraman. A variety of lens attachments such as ray shields, close-up adapters and range extenders are available for most lenses.

## Optical System

The optical system is rigidly mounted to the camera base and precisely aligned to the lens so that no operational adjustment for lens tracking is required. A broad G, R, B response together with a suitable electrical matrix is employed. Two filter wheels are fitted, the first containing three neutral density filters (.33ND, .75ND and 1.5ND) and the second containing two colour correction filters. These provide conversion for incident light at 4,100K and 6,000K. A third position on the second filter wheel is available for special effects such as star filters. The first filter wheel may be controlled either from the camera, the CCU or the remote control panel. The second filter wheel is controlled manually by the cameraman.

When the lens is withdrawn from the camera, a shutter is automatically placed across the lens port to prevent the intrusion of dust.

During automatic line-up an internal diascope is brought into use. Light from the diascope illuminates a special slide. At the same time a remotely controlled shutter containing a mirror is drawn across the optical axis blanking off the scene light and reflecting the diascope light into the prism. The optical system employs a reduced size of image on the red and blue tubes to increase the intensity of illumination on the pick-up tube faceplate, which reduces the differential coloured lag.



Camera with top cover in open position.







## Automatic Facilities

The Mark IXB automatic systems involve control by a microprocessor which ensures the highest possible degree of accuracy and repeatability of the automatic set up sequence.

### Operational

- (1) Automatic dynamic gain is provided as standard on the coder module.
- (2) The following are provided on the optional automatic balance module:
  - (a) Automatic white balance (when viewing a suitable white area)
  - (b) Automatic black balance (when the camera is capped)
  - (c) Automatic iris (when selected at CCP or RCP)
  - (d) Automatic master black (when selected at CCP or RCP sets master black to blackest part of G, R or B picture).
- (3) When the auto balance module is fitted an optional automatic registration module may also be fitted.

### Registration

When the sequential line-up button on the CCP or RCP is pressed the following actions take place automatically:

- (1) The internal diascope is brought into action.
- (2) The gains of the red and blue video paths are adjusted to make the respective peak signals equal to that of the green signal.
- (3) The picture is examined for relative displacement of green and red, and green and blue video signals. Correction is then applied to the appropriate parameters of the red and blue channels.

## Centring

When an automatic registration module is fitted a further optional automatic centring module may be added. This unit examines the normal video information and compares the timing of the three videos. Any misregistration present gives rise to timing differences and this information is used to generate centring correction voltages.

As a safeguard, errors must be confirmed in two different places, before corrective action is taken. In this way, the system is effectively proof against false signals derived from unusual picture patterns.

### Colour Balance

The cameraman frames a white subject in the centre of the picture. Automatic white balance is then achieved by red and blue video gain adjustment so that the red and blue video levels are equal to that of the green video.

When the automatic black balance is initiated the camera is automatically capped. The red, green and blue black levels are balanced and the circuit is then switched off.

### Master Black

This facility automatically adjusts the master black to give zero input at the blackest part of the green, red or blue picture. Switching between automatic master black and manual master black does not produce a sudden change in black level.

### Iris

This facility is capable of providing correctly exposed pictures for live transmission. The circuit examines the video in respect of both peak and mean signal and adjusts the iris accordingly. The circuit is relatively insensitive to small area highlights, e.g. speculars.

All the facilities mentioned above may be controlled at the CCP or RCP.

## Dynamic Gain

Some scenes of high contrast contain detail in the shadows which is lost when the camera iris is correctly set. The rapid adjustment of the transfer characteristic so that this detail is brought out without over exposure in the high luminance areas. Automatic dynamic gain can also improve scenes of very low contrast.

### Manual Version

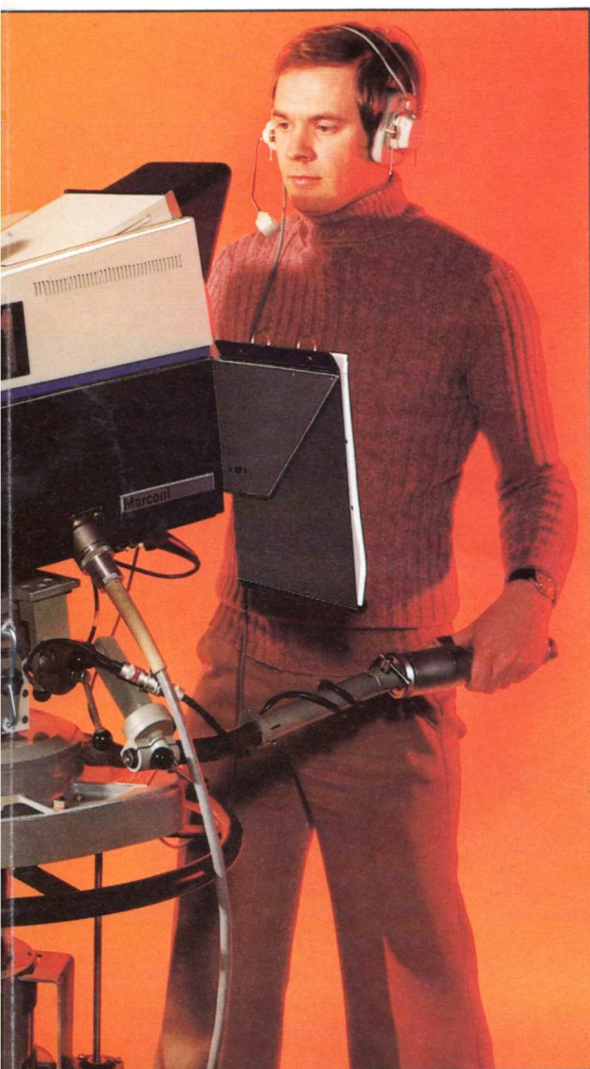
Manual versions are available as replacements for the automatic modules but automatic dynamic gain is always provided on the coder.

### Aperture Corrector

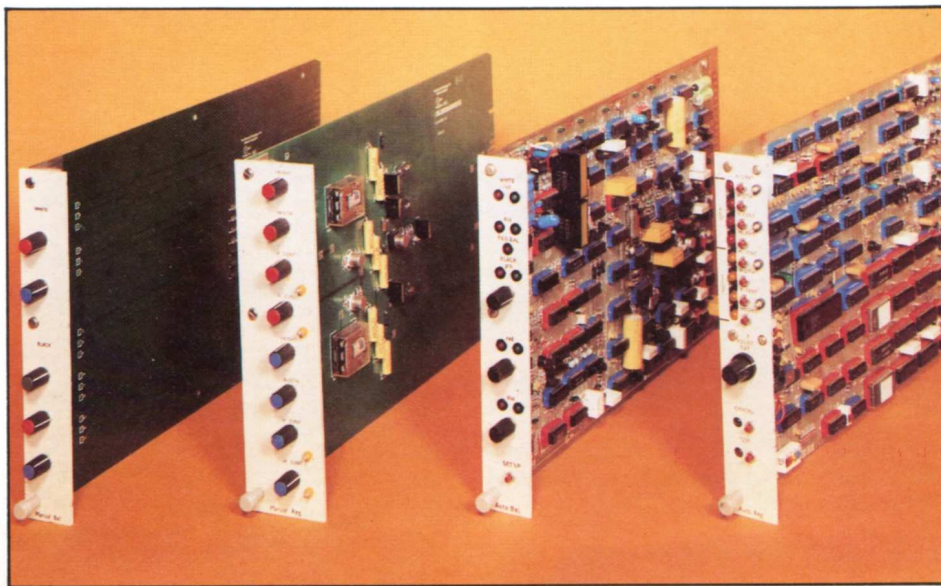
This unit provides two line aperture correction with coring and combing facilities. Before vertical correction the green signal is first passed through a horizontal corrector with a theoretical peak boost at 10.0MHz to compensate for pick-up tube losses.

A continuous correction signal is obtained by summing the vertical correction signal with an in-band peak signal to give equal enhancement of horizontal and vertical picture contours. The amount of combined signal is controlled by the CCP aperture correction control.

The corer circuit is used to suppress low-level modulation to reduce noise.



Automatic and manual CCU modules.





## Coder

This unit forms one module of the CCU. PAL and NTSC versions are available. The unit generates three outputs of standard level of which two are available on the rear panel.

Green, red and blue colour bar signals are supplied from the pulses module and changeover from camera to bars signal may be controlled either from the CCP or RCP. Selection of mono or mono plus burst is also available remotely.

The coder can produce BBC, EBU, EIC or 100% bars. Either split or full field. I and Q signals are also available with EIC split field bars from the NTSC coder.

Changes of bar configuration are selected by links.

The coder can operate in a true monochrome mode.

If it is desired the camera control unit can be employed with an external coder fed from the G, R and B video outputs at the rear panel, for example SEGAM.

## Remote Control Panel

This panel (as illustrated) contains all the controls necessary for remote control of the camera for both studio and OB operation. It may be operated up to 150m from the CCU.

In addition to the operational controls the camera may be registered and colour balanced from the panel. A switch on the joystick may be used to operate a picture matching matrix.

## Cues and Communications

Each camera channel is equipped with the following facilities.

- (1) A cameraman's headset outlet at the rear of the camera and, wired in parallel, a floor manager's headset outlet.
- (2) Volume controls for CCU talkback, programme audio (in the same ear), and for production talkback in the other ear.
- (3) A camera calling button.
- (4) A cameraman's speak to CCU/or speak to producer switch.
- (5) Cue light at the front of the camera and in the viewfinder. (The front cue light may be switched off from the camera for audience participation shows).
- (6) A speak/call switch at the CCU.
- (7) A cameraman calling alarm and 'Hold on' lamp.
- (8) CCU operator's headset socket.
- (9) Volume controls for camera talkback, programme audio and production talkback.
- (10) 'On Air' lamps on the CCU and RCP.
- (11) On the CCU a three-positional switch providing Camera (normal condition), Conference (all cameras and CCUs joined together) and Isolate (camera to CCU position).

The talkback system is universal and can work with either U.S. or European systems. It is designed to work with high quality moving coil headsets with built-in amplifiers. Carbon microphones can be used but will give inferior results.

### Programme Microphone Circuits

Two high quality programme microphone circuits are provided, extending from XLR plugs at the camera, via the camera cable to XLR plugs at the rear of the CCU. These circuits are fitted with limiters and are designed to accept a standard dynamic microphone input. Level controls are provided at the camera, together with LED indicators.

## Ordering Information

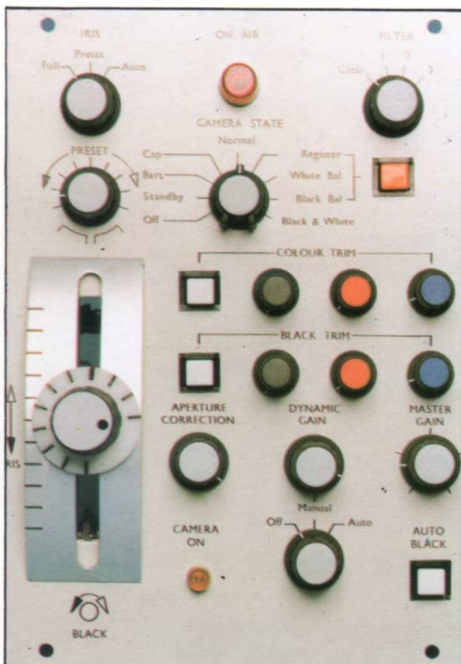
To ensure that your order is quickly processed and that you receive the correct items, please specify:

- (1) Television standard and system required.
- (2) Length of camera cable.
- (3) AC supply voltage and tolerance.
- (4) Type of zoom lens and whether servo or manual, range extenders, etc.
- (5) Cabinet/rack mounting arrangements.
- (6) What options are required.
- (7) If a friction head and tripod/pedestal are required. (State camera application, i.e. studio or outside broadcast.)
- (8) If test charts are required.
- (9) If spares are required.
- (10) If camera tubes are required and type preferred.
- (11) If additional handbooks are required.
- (12) If headsets are required.
- (13) If training is required.
- (14) Distance of remote control panel from CCU.
- (15) Any additional items of equipment needed, such as picture and waveform monitors, sync gens., communication units, etc.

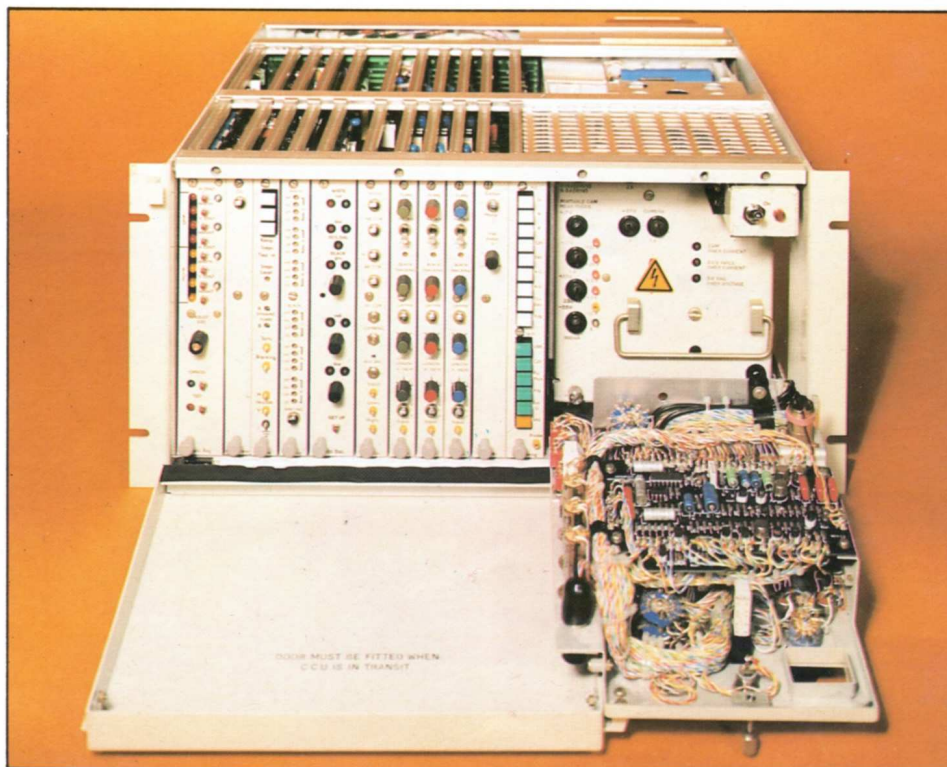
### Optional Items

Programme microphone.  
Camera shot box.  
Headsets.  
Long viewfinder hood.  
Tube simulator.  
Synchronizing Pulse Generator.  
Waterproof cover.  
Studio extender kit.  
Remote Control Panel (supplied as standard with Automatic Mark IXB).  
Extended red matrix.  
HOP tubes.  
Attachment clamps.

Remote control panel.



CCU, showing access to power supply behind CCP





# Data Summary

## Systems

CCIR 625 lines, 50 fields/s 2:1 interlaced or EIA 525 lines, 60 fields/s 2:1 interlaced (not switchable).

## Power Supply

95–130V and 190–260V 48–60Hz.

Consumption approx. 350Va.

At any voltage within the specified range, a swing of  $\pm 5\%$  will not affect performance. CE22 connector.

## Inputs

Mixed blanking: (1.5–6V), bridging input, BNC connector. Return loss 30 dB to 2T pulse and bar.

Mixed sync input: same as for mixed blanking.

Colour step sync input: 1.5–6V, BNC connector. Return loss 30 dB.

Remote video: 1.0V composite signal, bridging input, BNC connector. (Return loss 36 dB to 2T pulse and bar).

Burst gate (PAL): 1.5–6V, BNC connectors bridging input, return loss better than 30 dB to 2T pulse and bar.

Subcarrier 0.5–3V, bridging input, BNC connectors. Return loss 30 dB at subcarrier frequency.

Test: 0.7V non-composite signal bridging input. Return loss 36 dB to 2T pulse and bar.

External green: as for test input.

## Outputs

Coded video: 2 outputs, each 75  $\Omega$  source impedance. Return loss better than 30 dB to 2T pulse and bar. GRB video: 0.7V peak-peak from 75  $\Omega$  source.

Picture monitoring video: 75  $\Omega$  source. Return loss better than 30 dB to 2T pulse and bar.

Waveform monitoring video: as for picture monitoring.

Colour step sync: 75  $\Omega$  source.  
Colour step waveform: 2V to 15V adjustable. Output impedance less than 500  $\Omega$ .

Waveform monitor sequence: isolated relay contacts.

Chroma key signal (colour selection by links): 0.7V peak-peak from 75  $\Omega$  source.

Programme audio (2 circuits): 0 dBm.

XLR connector.

## Sensitivity

With 800 lux (75 ft candles) incident on a white chip of 60% reflectance and lens iris at f4, a signal current of 300 nA will be obtained in the green channel using average tubes. This signal current produces 0.7V video output with master gain control at 0 dB.

By increasing gain to +12 dB and opening the iris to f2.2, just acceptable pictures will be obtained down to 50 lux (5 ft candles).

## Signal-to-Noise Ratio

(Multicore version)

Measurements with Rohde and Schwarz meter type UPSF.

Zero gain, unity gamma, corrections off.

PAL (5.5 MHz bandwidth): luminance S/N 49 dB (unweighted).

NTSC (4.2 MHz bandwidth): luminance S/N 51 dB (unweighted).

By increasing light level and reducing gain by 3 dB further improvement in signal/noise ratio may be obtained.

## Resolution

With aperture correction, 100% modulation depth can be obtained at 5 MHz.

## Registration

40 ns accuracy in Zone 1, 80 ns in Zone 2, and 120 ns in Zone 3, (with average tubes).

Zone 1 is an ellipse whose major and minor axes are equal to 80% of picture height and width; Zone 2 is outside Zone 1, but within a circle of diameter equal to picture width; Zone 3 is the remainder.

## Scanning Geometry (excluding lens)

Overall distortion: less than 0.25% of picture width in Zone 1, less than 0.5% in Zone 2 and less than 1.0% in Zone 3.

## Gamma Correction

Continuously variable from 0.4–0.55, or 1.0.

## Master Gain

Control is provided over the range 0 to +12 dB from either the CCP or RCP. This range may be changed to –3 dB to +9 dB by link adjustment.

## Shading

Shading correction, line and field, sawtooth and parabola, black and white, is provided as standard.

## Warming Up Time

Rehearsal quality pictures will be obtainable in less than 2 minutes after switch on in the ambient temperature range of +10°C to +45°C.

## Camera Cable

Multicore.

The following type can be employed up to a maximum length of 900 m (3000 ft): BICC T.1889 (13 mm 34-way).

Suitable cable is also manufactured by B.I.W. and Mohawk. Other types of cable may also be used with adaptors.

## Pick-up Tubes

30 mm lead oxide tubes either standard, extended red, HOP or variable light bias types.

Suitable tubes include P8130 series Ledicons\* and XQ1410 series Plumbicons\*\*.

\* Registered trade mark of The English Electric Valve Co Ltd, Chelmsford, England CM1 2QU.

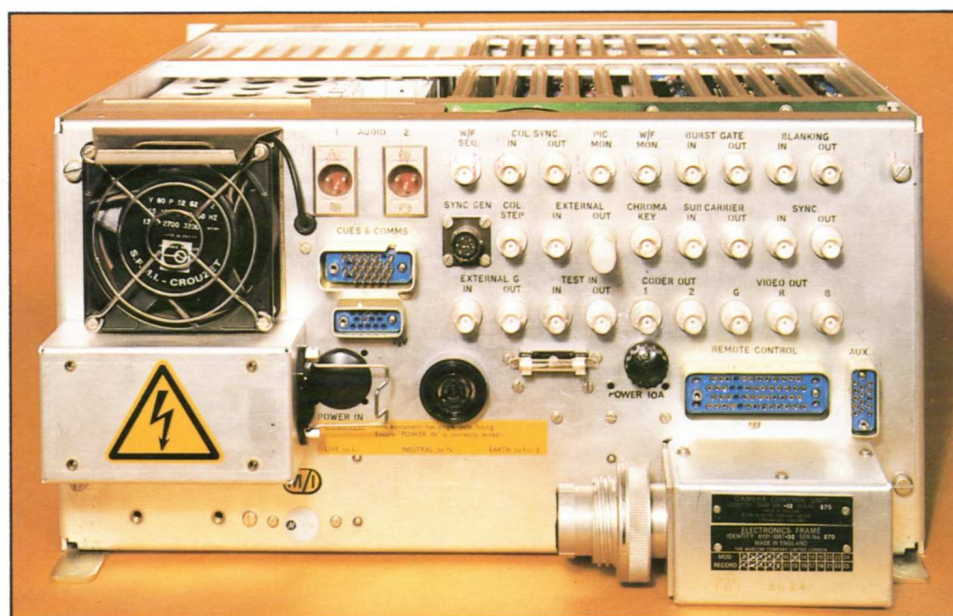
\*\* Registered trade mark of NV Philips Gloeilampenfabrieken, Eindhoven, The Netherlands.

Dimensions	Height	Width	Length	Weight
Camera	408 mm (16 in)	360 mm (14.25 in)	580 mm (22.75 in)	24 kg (75 lb)†
Camera control unit	222 mm (8.75 in)	483 mm (19 in)	556 mm (21.9 in)	24.5 kg (54 lb)
Remote control panel	206 mm (8.1 in)	149 mm (5.87 in)	105 mm (4.1 in)	1.4 kg (3 lb)

†Weight includes viewfinder but excludes lenses.

## Ambient Temperature

- Storage –20°C to +60°C.
- Equipment may be switched on without damage over the range –20°C to +40°C.
- No change in performance data will occur at ambient temperature variations of  $\pm 10^\circ\text{C}$  with respect to the temperature during the line-up procedure, within a range of –10°C to +40°C.



Rear view of CCU.





## Lenses

A wide variety of lenses may be fitted.

Type	Range mm	Max. aperture	Min. focusing distance	Basic horizontal angle	Weight (kg)
Varotal 22B	21-210	f2.9	1.2 m	44°-4.4°	10
Angenieux 15X18E81LC	18-270	f2.0-f3.0	0.64 m	51°-3.7°	19
Angenieux 12X16E31	16-192	f2.0	0.95 m	56°-5°	28
Angenieux 42X16E81	16-675	f2.0-f6.8	0.64 m	56°-1.5°	24
Angenieux 42X32	32-1350	f2.3-f7.6	4 m	22°-0.5°	34
Schneider 30X20	20-600	f2.1-f6.3	0.85 m	45°-1.6°	16
Schneider 15X16	16-240	f2.1-f2.8	0.4 m	56°-4.2°	17
Schneider 30X33	33-1000	f2.1-f6.3	3 m	29°-0.98°	20
Schneider 30X16	16-480	f2.1-f6.3	0.4 m	56°-2°	17.5

This document gives only a general description of the product(s) and shall not form part of any contract. From time to time changes may be made in the product(s) or in the conditions of supply.

**Marconi**  
Communication Systems



Broadcasting Division  
Chelmsford, England CM1 1PL  
Telephone 0245 353221 Telex 99201  
Facsimile 0245 87125 Groups 2 & 3