



Plan position indicator for labelled raw
radar data

High-speed writing capability

The Marconi Type S3009 display operates in an analogue mode and is intended primarily for use as a plan position indicator for raw radar with character writing capability.

Mechanical Features

The basic framework of the display is constructed from aluminium sections. The cathode-ray tube, its deflection coils and screen are all contained in a rigid fibre-glass housing, forming a single removable assembly attached to the front panel by latches. Knurled thumbscrews adjust clamps to hold the tube firmly within the housing. The panel carries the implosion guard, filter bearing ring, and immediate controls. The complete panel/housing assembly latches into the front of the framework.

The circuitry is carried on ten plug-in printed circuit boards.

Also mounted within the frame are the extra-high-tension power unit and stabilizer and a focus setting unit.

Overall, the unit measures 457mm (1ft 6in) high by 457mm (1ft 6in) wide by 870mm (2ft 10¼in) deep and weighs 54kg (120lb).

Electrical Features

Cathode Ray Tube

The cathode ray tube is 400mm (16in) diameter, electromagnetically focussed and deflected. The phosphor may be either long persistence for raw radar alone, or medium persistence for marked raw radar. The spot size is not more than 0.6mm (0.024in) at 50 microamps beam current at any part of the useful screen with the deflection circuits live and all inputs shorted.

Deflection Amplifiers

The main deflection amplifiers accept either time-base or stepped level waveforms, with a settling time of 80 microseconds. A second small aperture, wide bandwidth deflection system provides for high-speed character writing.

An expansion and off-centring amplifier provides expansion in four range scales, $\times 1$, $\times 2$, $\times 4$, $\times 8$ about the tube centre; the off-centring capability is up to one radius on the $\times 1$ expansion setting and there is a corresponding capability on the other scale settings. Both facilities may be selected by front-panel controls, and they enable selected responses to be centred and expanded for close examination.

The cathode ray tube is protected by scan failure circuits which blank the trace if the main deflection fails, and by polygonal blanking circuits which inhibit the tube brightness when the beam is deflected beyond the boundaries of a regular

polygon enclosing the useful screen area, thus preventing blooming.

Video Amplifiers

The video amplifier contains six channels, two radar video inputs with short-time-constant control and trace compensation and four similar inputs for secondary radar video, range marks, video maps and azimuth marks; also four bright-up inputs for intertrace facilities with blanking, trace dimming and heading marker inputs. With an input pulse varying from 1 microsecond to 3 milliseconds width at a 4-millisecond period, the form of the video amplifier output does not vary by more than 10% from that of the input. Each bright-up channel has a separate pre-set limit level control and all channels are further adjusted by a single operator control. All video bright-up channels have edge response times not greater than 150 nanoseconds.

Extra-high-tension (e.h.t.) Unit

The e.h.t. unit consists of a free-running oscillator, the output of which is rectified and multiplied using a ladder network. The final output voltage is stabilized with a corona stabilizer at a level of 14kV.

Power Supply Unit

The power supply unit may be either clamped to the bottom of the display or located up to 31m (100ft) away.

Operational Features

Implosion Screen Filter and Cursor

Protection against tube implosion is provided by an armoured glass face plate. A flat, plastic screen is tinted to serve as an amber filter. It is rotatable and has cursor lines for use with a bearing ring.

Filters

The amber screen is always fitted but an additional circular polarizing filter may be fitted.

Bearing Ring

This surrounds the tube face and is adjustable for zero position. It is calibrated 0 to 360° in 1° steps.

Controls

The immediate display controls for expansion, off-centring, video gain etc., are incorporated into the front panel.

Panel Illumination

As an option, the cursor, bearing ring and control calibration may be illuminated using an edge lighting system.

Data Summary

Power input:

200 to 250V $\pm 10\%$; 48 to 52Hz, single phase, 500VA.

Useful screen size:

365mm (14 $\frac{3}{8}$ in) diameter.

Focus

Spot size:

not more than 0.4mm at 50 μ A beam current, at the screen centre, with all deflection inputs at zero but the circuit live.

Deflection defocusing:

not more than 50% increase in any direction, measured across the spot axis, from the spot size at the screen centre.

Stability:

focusing adjustments are unnecessary more frequently than 200 hour intervals.

Main deflection amplifiers (X and Y)

Input:

single phase differential having a basic sensitivity of 10V or 25V per radius. 0V differential corresponds to zero deflection.

Input impedance:

10k Ω or 25k Ω .

Expansion:

4 ranges, $\times 1$, $\times 2$, $\times 4$ and $\times 8$.

Off-centring:

\pm one radius on minimum expansion. The off-centring voltages are fed out for use in the back-up equipment where the current demand must not exceed 10mA.

Settling time across diameter:

less than 80 μ s within 0.4mm.

Intertrace wander:

less than 0.4mm.

D.C. non-linearity:

less than 1% of tube diameter.

Trace/intertrace registration:

within 0.3mm at all points (except during the first 10 μ s) when the applied timebase produces a deflection on the tube face such that 350mm represents not more than 80 data miles.

Pointer/pointer registration:

within 0.75mm at all points (except during the first 10 μ s) when the applied timebase produces a deflection on the tube face such that 350mm represents not more than 16 data miles.

Long term drift:

less than ± 7.5 mm in 200 hours.

Auxiliary deflection amplifiers (X and Y)

Input:

symbol: ± 4 V.

shift: ± 2 V.

Impedance:

1k Ω .

Aperture:

When set up, zero deflection is obtained for an input signal level of ZERO with respect to the differential earth input. The deflection aperture is then not less than ± 8 mm about the zero deflection point.

Small signal bandwidth:

nominally flat from d.c. to high frequency fall-off, specified as the deflection at 1.5MHz being less than 30% down on a 2.0mm line measured at 15kHz.

Large signal writing speed:

not less than 6.5mm/ μ s.

Non-linearity:

not more than $\pm 5\%$.

Long term drift:

not more than $\pm 5\%$ of aperture.

Delay:

less than 0.1 μ s.

Video amplifier

Radar video channels 1 and 2

Nominal input:

+2V, referred to earth. Noise up to 0.5V.

Nominal input impedance:

1k Ω .

Rise and fall time:

less than 0.25 μ s.

Gain:

continuously variable front panel control.

S.T.C.:

four positions, front panel switching. 1.5 μ s, 5.0 μ s, 15.0 μ s and normal long.

Keying:

control line earthed for OFF, open-circuited for ON.

Non-radar video channels (Video Map, Range Marks, IFF/SSR, Azimuth Marks)

Nominal input:

+2V referred to earth.

Nominal input impedance:

1k Ω .

Rise and fall times:

less than 0.25 μ s.

Gain:

continuously variable front panel controls.

Keying:

control line earthed for OFF, open-circuited for ON.

Radar bright-up channel

Nominal input:

+2V referred to earth for duration of radar bright-up period.

Nominal input impedance:

greater than 1k Ω .

Centre blanking:

front edge of pedestal waveform may be clipped up to 200 μ s, front panel control.

The 'off-state' occurs with the input open circuit.

Radar bias channel

Nominal input:

off level: -2.3 V to -3.4 V.

on level: earth to -0.4 V.

Nominal input impedance:

greater than 1k Ω .

The 'off-state' occurs with the input open-circuit.

Intertrace bright-ups (4 off)

Nominal input:

+2V referred to earth, 100 μ s duration.

Nominal input impedance:

75 Ω .

Rise and fall times:

less than 0.15 μ s.

Extra intertrace bright-up (controlling I.T.B.U.1 only)

Nominal input:

+2V minimum referred to earth, 100 μ s duration.

Nominal input impedance:

1.5k Ω .

Video blanking (both channels)

Input:

unblanked condition, earth.

blanked condition, -2V.

Input impedance:

4.7k Ω .

Rise and fall times:

better than 1 μ s.

Radar/intertrace bias switching

The intertrace bias is normally set to the dynamic cut-off level by a pre-set control. The radar-trace bias may then be increased by a continuously variable control to up to 10V below the intertrace

bias. The switching between the two states is controlled by the radar bias channel input and takes less than 2 μ s.

Heading line

External earth contact of indeterminate width produces a pulse, fixed in duration but pre-set from less than 500 μ s to greater than 4ms. Pre-set gain control, ON/OFF keying.

Environment

Temperature:

-10°C to +40°C. Adjustment unnecessary over \pm 10°C range.

Relative humidity:

up to 95% at 25°C.

Pressure:

down to 450mm mercury.

Dimensions (overall)

Height:

457mm (1ft 6in).

Width:

457mm (1ft 6in).

Depth:

870mm (2ft 10 $\frac{1}{4}$ in).

Weight:

54kg (120lb).

The information given herein is subject to confirmation at the time of ordering.

Marconi Radar Systems Limited

A GEC-Marconi Electronics Company

Crompton Works, Chelmsford, England CM1 3BN

Telephone: Chelmsford (0245) 67111. Telegrams: Marstor Chelmsford Telex.

Telex: 99108 and 99449.

F4

ISSUE 3