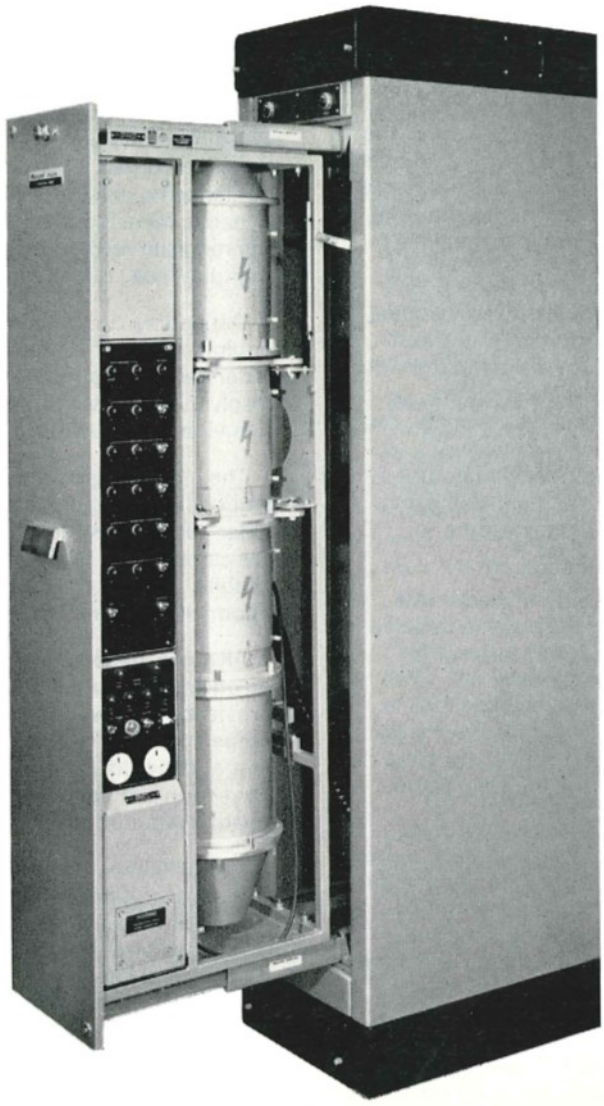
Marconi Radar Data Sheet F7

Fixed-Coil Video Map Generator Type S3202



No moving parts

High resolution

Transistorized

The Marconi Video Map Generator Type S3202 is a transistorized unit which electronically superimposes maps or other topographical markings on the screen of a PPI display, in addition to the radar picture. The map or grid is marked photographically on a glass slide and converted by a scanning system into video signals. These are mixed with the video signals from the radar and displayed simultaneously on the screen.

A fixed-coil flying spot scanning system has been chosen because modern techniques of angular data transmission from the radar head do not necessarily involve the reconstitution of a shaft rotation in the radar office. It can be an embarrassment to have to do this just for the sake of video-mapping equipment when the incoming angular data is in the form of resolved d.c.

The accuracy of the video-mapping signals generated by the equipment equals that of the best moving-coil types, and is maintained over a considerable period of time without the need for resetting, provided that the temperature of the air cooling the equipment is maintained within the prescribed limits.

The map plates are 8·25cm (3·25in) square, with the active map area contained within a central circle of 5·1cm (2in) diameter. Individual map plates, once they have been set up mechanically in their associated assembly, can be rapidly interchanged with no necessity for resetting of any kind. One cathode ray tube is used to scan one map plate, thus simplifying the optical system and giving optimum performance.

Setting up is effected using a special test plate and a dual trace oscilloscope to observe the output video signals. A PPI monitor is not essential for this operation.

Mechanical Features

Two main mechanical versions of the equipment are available. One version is internally blown with a high-speed, low-noise fan, while the other is designed for connection to external air-conditioning equipment. The video-mapping equipment can be fitted and transported in military vehicles but not operated in motion.

All the equipment necessary to generate video-mapping signals from one map plate is contained within one frame, mounted on runners, and fitted into a cabinet. Within the framework are electronic circuits on printed cards which plug into edge connectors, the complete optical assembly, a heat sink assembly carrying high-power transistors, the e.h.t. supply generator and a mains-operated power unit. The engineering form of the cabinet is such that rear access is not essential for installation, operation or maintenance.

Alternative cable entries are provided at the base and top of the cabinet. The bottom cable entry is at the rear, and for front access locations the equipment frame may be removed from its runners to introduce cables. The signal connectors used are of the B.N.C. quick-release type and the mains supply connection by terminal block.

Electrical Features

In this video mapping, equipment transistors are used exclusively.

The cathode-ray tube employed is a Ferranti Microspot type 7/29; a 7-inch diameter flat face tube with a 40-degree deflection angle, operating at 15kV. Three types of coils are contained in the coil assembly, namely, alignment and astigmatism coils, focus coils, and deflection coils.

The alignment coils initially deflect the electron beam so that it enters the focus and deflection fields on axis. This is necessary for optimum focusing of the beam and to avoid asymmetrical deflection errors. The focus coil assembly contains the main and dynamic focus coils; dynamic focusing being necessary to maintain the requisite resolution over the entire area of the tube face.

Depending on the edition specified, the equipment accepts either radar trigger pulses or radar gate pulses, and either resolved d.c. or resolved time-base turning data, and will produce five video signals from a single map plate.

The input trigger pulses are used to generate radar gate pulses of suitable duration. These radar gate pulses then control the 'ON' time of the cathode-ray tube beam, the scan correction circuits, and, for the case when d.c. turning information is used, the scan generators.

All range-dependent components are mounted on one printed circuit board, adjustment being provided to allow for component tolerance, one range board being required for each specified range. It should be noted that, since the scan correction components are range-dependent, this board is required in all editions of the equipment.

The deflection amplifiers are operated at fixed gain, but are fitted with d.c. setting controls to permit the origin of the scan rotation to be correctly positioned on the tube face. The rotating scan is then imaged on to the map plate and a lens assembly collects and distributes the light passing through the map plate over the cathode of a low noise photo-multiplier tube. The signal from the photo-multiplier tube is amplified, clipped and distributed to the associated display system.

The following is a list of the facilities that are dependent upon the edition of the equipment specified.

Note:
Operating range or ranges required must be specified for either type of turning signal.

Cooling arrangement:
self-blown or externally blown.
Cabinet heaters:
with or without.
Hour meter:
if required, the mains frequency must be specified.

Data Summary

Power input

Voltage:
200 to 250V±10%
or 100 to 125V ±10%, 45 to 65Hz, single phase.
Consumption:
0·5kVA.

Turning information:
d.c. or time-base voltages varying at radar antenna rate, from:
+10V (±1V) to −10V (±1V) with an input impedance of 140kΩ.
or from:
+50V (±5V) to −50V (±5V) with an input impedance of 700kΩ.
When time-base voltages are used, an antenna rotation failure signal is required.
Fail:
between the limits −0·5V to +2V.
Operable:
more negative than −4V.

Radar trigger pulses

P.R.F.:
150Hz to 1500Hz.
Amplitude:
5V to 80V positive going.
Duration:
1·5 to 10μs.
Rise time:
less than 1μs.
Input impedance:
75Ω terminated.
3kΩ unterminated.

Radar gate pulses

Input level 'OFF':
more negative than −2·5V.
Input level 'ON':
between the limits −0·5 to +2V.
Input impedance:
75Ω terminated.
3kΩ unterminated.

Ranges:
18km (10 nautical miles) to 740km (400 nautical miles).

Deflection system stabilizing time:
flyback time: 3% of range or 120μs whichever is the greater.
initial non-linearity: 10μs maximum.

Positional accuracy of output signals:
Assuming no errors are present in the input data or in the map slide and that the equipment has been set up correctly, the positional error of the signals generated will be such that nowhere does the X or Y component exceed ±0·3% of the maximum range to which the trace is set. This corresponds to a maximum possible angular error of ±15 minutes of arc at maximum range or a range error of 0·5%.

Short-term stability of the output signals:
Assuming no drift in the input data and that the temperature does not depart by more than ±5°C from the value which applied when the equipment was set up, the positions of the signals generated will change by an amount such that nowhere does the X or Y component exceed ±0·15% of the maximum range to which the trace is set. This corresponds to a maximum possible angular shift of ±15 minutes of arc at half maximum range or a shift in range of ±0·2%.

Resolution:
A line thickness equal to 1/2000 part of the slide diameter will be resolved at any part of the slide. This is equivalent to 1000 TV lines (i.e. 500 white and 500 black to the radius).

Video outputs:
Five outputs are provided.
Amplitude: 3V ±0·5V positive going.
Output impedance: 75Ω.

Environment

Temperature:
Operational: −10°C to +45°C.
Survival: −30°C to +70°C.
Inside the operating range no readjustment of setting for optimum performance shall be required for a change of less than ±5°C.

Relative humidity:
The equipment is capable of normal operation at 95%. The design allows for the ready addition of anti-condensation heaters. Special precautions are required for packaging ex-factory and prolonged storage (sealed polythene pack containing dehydration agent).

Pressure:
Operational: 450mm Hg (17·7in Hg).
Survival: 250mm Hg (10in Hg).

Dimensions

Height:
182cm (71¾in) externally blown.
190cm (75in) internally blown.
Width:
41cm (16in).
Depth:
58·4cm (23in) excluding handle.
61·4cm (24⅛in) overall.
Weight:
254kg (560lb).
Finish:
oyster hammer.

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

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ISSUE 3

150673/1000+3500