B.R. 2137(3)

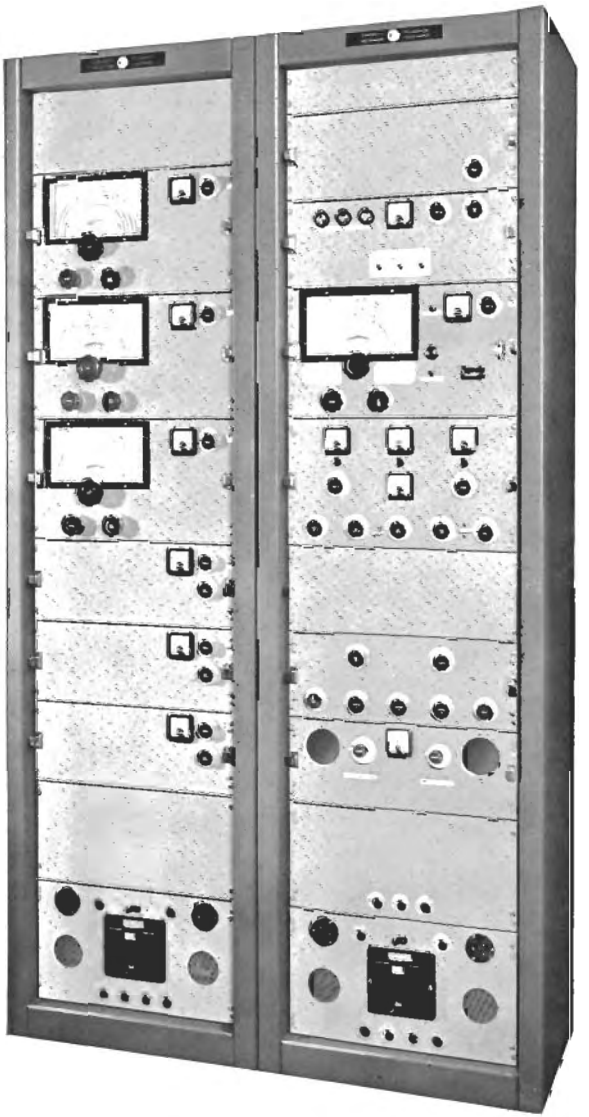
TRIPLE DIVERSITY RECEIVING OUTFIT CGK

(FOR F.S.K. C.W. RECEPTION)

Operating Instructions

ANY SUGGESTIONS FOR AMENDMENTS OR ADDITIONS TO THIS BOOK SHOULD BE SUBMITTED TO THE CAPTAIN SUPERINTENDENT, ADMIRALTY SIGNAL AND RADAR ESTABLISHMENT, THROUGH THE USUAL CHANNELS.

Radio Equipment Department, Admiralty
1957 (R.E.533/57)



TRIPLE DIVERSITY RECEIVER TYPE HR. 13

TRIPLE DIVERSITY RECEIVER
TYPE HR.13

1 INTRODUCTION

The equipment provides for triple diversity reception of CW, MCW or FSK (100-840 c/s shift) signals in four ranges in the band from 3-27.5 Mc/s. The receiver has a sensitivity of a high order and its provisions include, a high stability variable local oscillator and 6 crystal controlled spot frequencies. It is housed in two cabinets with self-contained power supplies each with circuit breaker protection.

The receiver embodies a triple-superheterodyne circuit with intermediate frequencies of 2,600, 100 and 10 kc/s (FSK only).

The main selectivity is at 100 kc/s; bandwidths of 2 kc/s, 1 kc/s and 0.5 kc/s being provided.

Frequency Shift Diplex signals (total shift 1,200 c/s) may be received by the addition of an extra unit.

2 TECHNICAL SUMMARY

2.1 SALIENT FEATURES

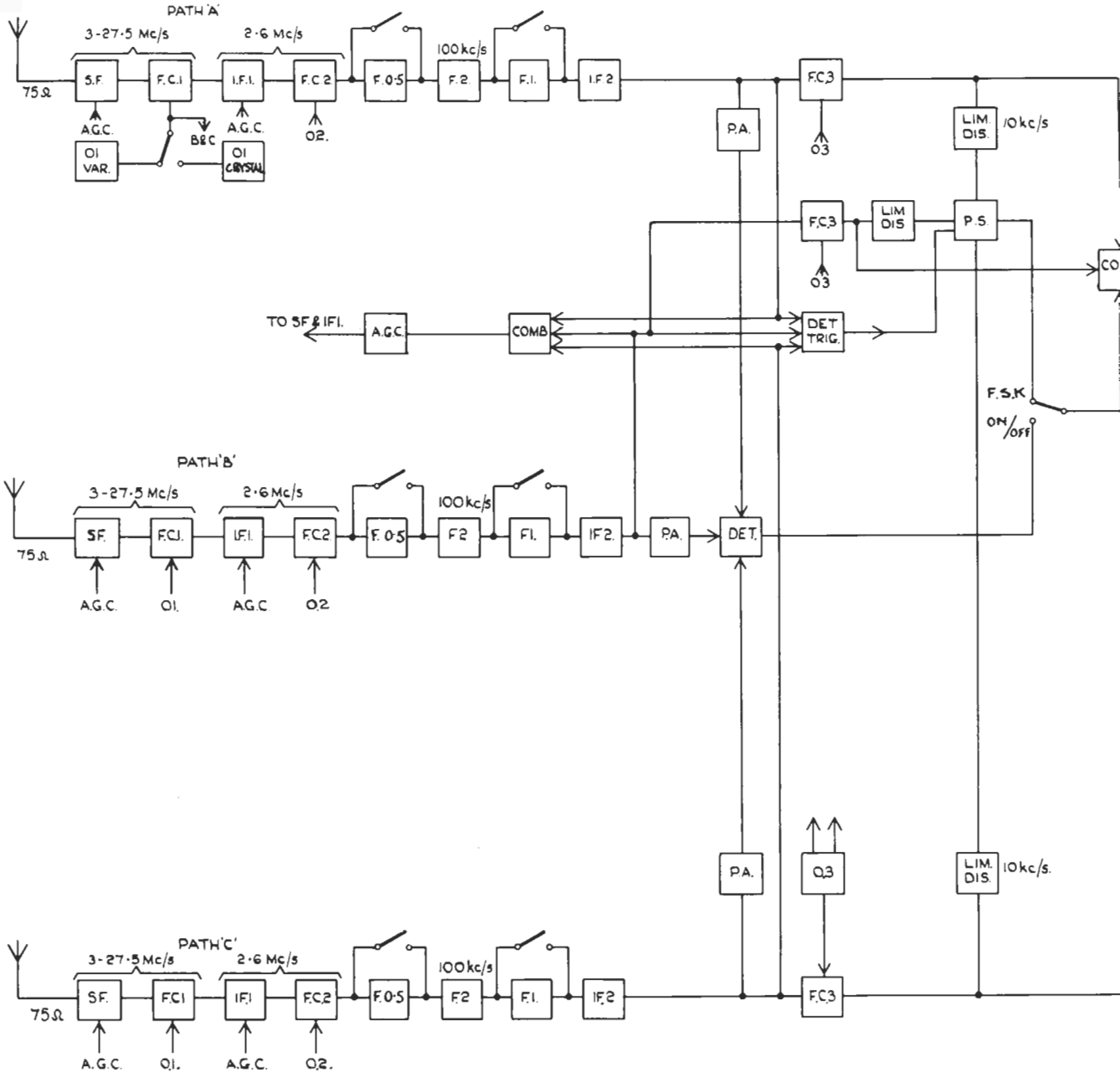
The figures quoted in this section are nominal.

2.1.1 Salient Features (Electrical)

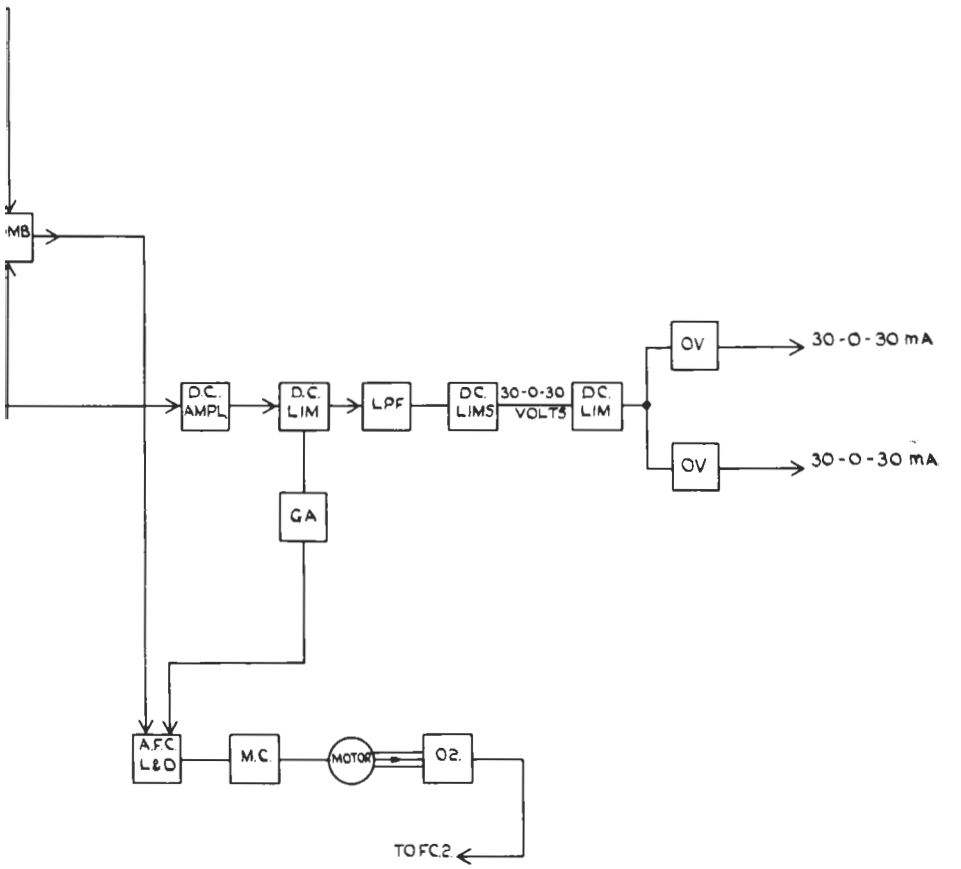
Types of signal received :	Triple diversity reception of CW, MCW or FSK (100-840 c/s shift) signals.
Frequency Coverage :	3 to 27.5 Mc/s in 4 ranges. Range 1 3.0 to 6.0 Mc/s Range 2 6.0 to 10.0 Mc/s Range 3 10.0 to 17.0 Mc/s Range 4 17.0 to 27.5 Mc/s.
Frequency Selection :	The receiver may be crystal controlled at any one of 6 spot frequencies or it can be controlled by an LC oscillator at any frequency within the band 3-27.5 Mc/s.

Maximum Receiving Speed :	~~400~~ 500 Bauds (~~500~~ 625 WPM Morse Code). 100 Bauds (125 WPM Morse Code) with 0.5 kc/s bandwidth and 200 c/s shift. 200 Bauds (250 WPM Morse Code) with 1 kc/s bandwidth and 560 c/s shift. 400 Bauds (500 WPM Morse Code) with 2 kc/s bandwidth and 840 c/s shift.
Variable First Oscillator :	A variable LC-controlled first frequency-change oscillator may be switched in place of the crystal first oscillator so that the receiver may be tuned to any desired frequency in the band. A high degree of mechanical and thermal stability is obtained by employing a master oscillator covering a single range at a comparatively low frequency and by using temperature compensating circuit elements. Frequency multipliers are used to provide the final frequency required for frequency changing.
Fine Tuning :	A fine tuning control of the second oscillator is provided which enables a variation of ±3 kc/s to be made at any working frequency.
Aerial Input :	The receiver is designed to accept signals from coaxial lines of 75 ohm impedance.
AFC :	The AFC circuits control a motor which varies the second oscillator frequency so that the tuning error is less than 4 c/s.
Crystal Filters :	The crystal filters incorporated in the 100 kc/s IF amplifier have nominal bandwidths of 0.5, 1 and 2 kc/s.
Monitoring :	All the necessary instruments for checking the operation are incorporated in the equipment.

Power Supply :	Single Phase AC Mains 200 to 250V 50 c/s. Acceptable voltage variation ±6%, frequency variation ±4%.
Power Consumption :	Approximately 650W. pf. 0.95.



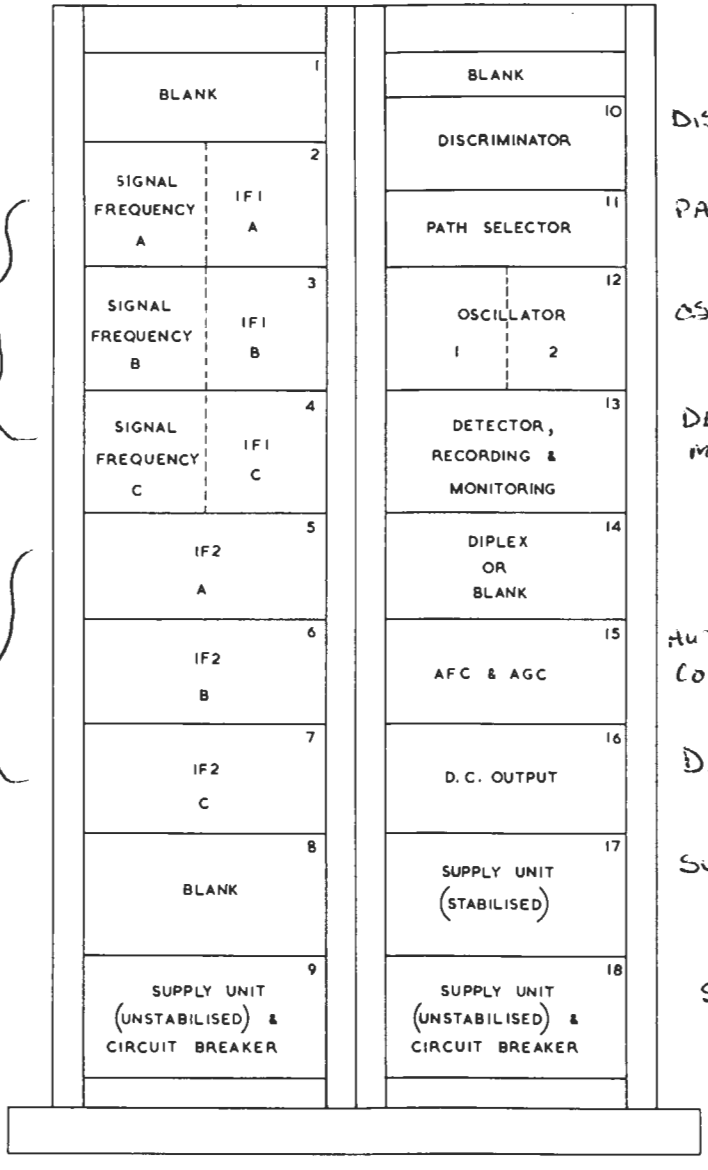
BLOCK DIAGRAM,
TRIPLE DIVERSITY TELEGRAPH RECEIV
WZ.-9301/D Sh. 1 Iss. 2



VER TYPE HR 13

S.F.	SIGNAL FREQUENCY AMPLIFIER.
F.C.	FREQUENCY CHANGER (1ST 2ND & 3RD)
I.F.	INTERMEDIATE FREQUENCY AMPLIFIER (1ST & 2ND)
F.0·5	100kc/s CRYSTAL FILTER 0·5kc. B.W.
F.1.	100 kc/s CRYSTAL FILTER 1 k.c. B.W.
F.2.	100 kc/s CRYSTAL FILTER 2kc. B.W.
P.A.	100 kc/s POWER AMPLIFIER
P.S.	PATH SELECTOR GATE VALVE.
LIM. DIS.	SIGNAL LIMITER & DISCRIMINATOR. 10 kc/s.
DET.	ON/OFF DETECTOR & SLIDE BACK.
A.G.C.	AUTOMATIC GAIN CONTROL AMPLIFIER.
D.C. AMPL.	D.C. AMPLIFIER.
D.C. LIM.	D.C. LIMITER.
L.P.F.	LOW PASS FILTER.
O.V.	D.C. OUTPUT VALVES.
G.A.	A.F.C. GATE AMPLIFIER
A.F.C. L&D.	A.F.C. LIMITER & DISCRIMINATOR
M.C.	A.F.C. MOTOR CONTROL CIRCUITS.
O1.VAR.	FIRST OSCILLATOR VARIABLE
O1.CRY.	FIRST OSCILLATOR CRYSTAL
O2.	SECOND OSCILLATOR
O3.	THIRD OSCILLATOR 90 kc/s.
DET&TRIG.	DETECTOR & TRIGGER CIRCUITS.
COMB.	AFC. & AGC. COMBINING CIRCUITS.

CABINET RECEIVING AND FSK. WITH PLINTH A.P. 102570.



SIGNAL AND I.F. UNIT A.P. 102571

I.F.2 UNIT AP 102572

SUPPLY UNIT A.P. 102559

DISCRIMINATOR PANEL A.P. 102591

PATH SELECTOR UNIT A.P. 102575

OSCILLATOR 1 & 2 UNIT A.P. 102574

DETECTING, RECORDING AND MONITORING UNIT. AP. 102576.

AUTO FREQUENCY AND GAIN CONTROL UNIT A.P 102577

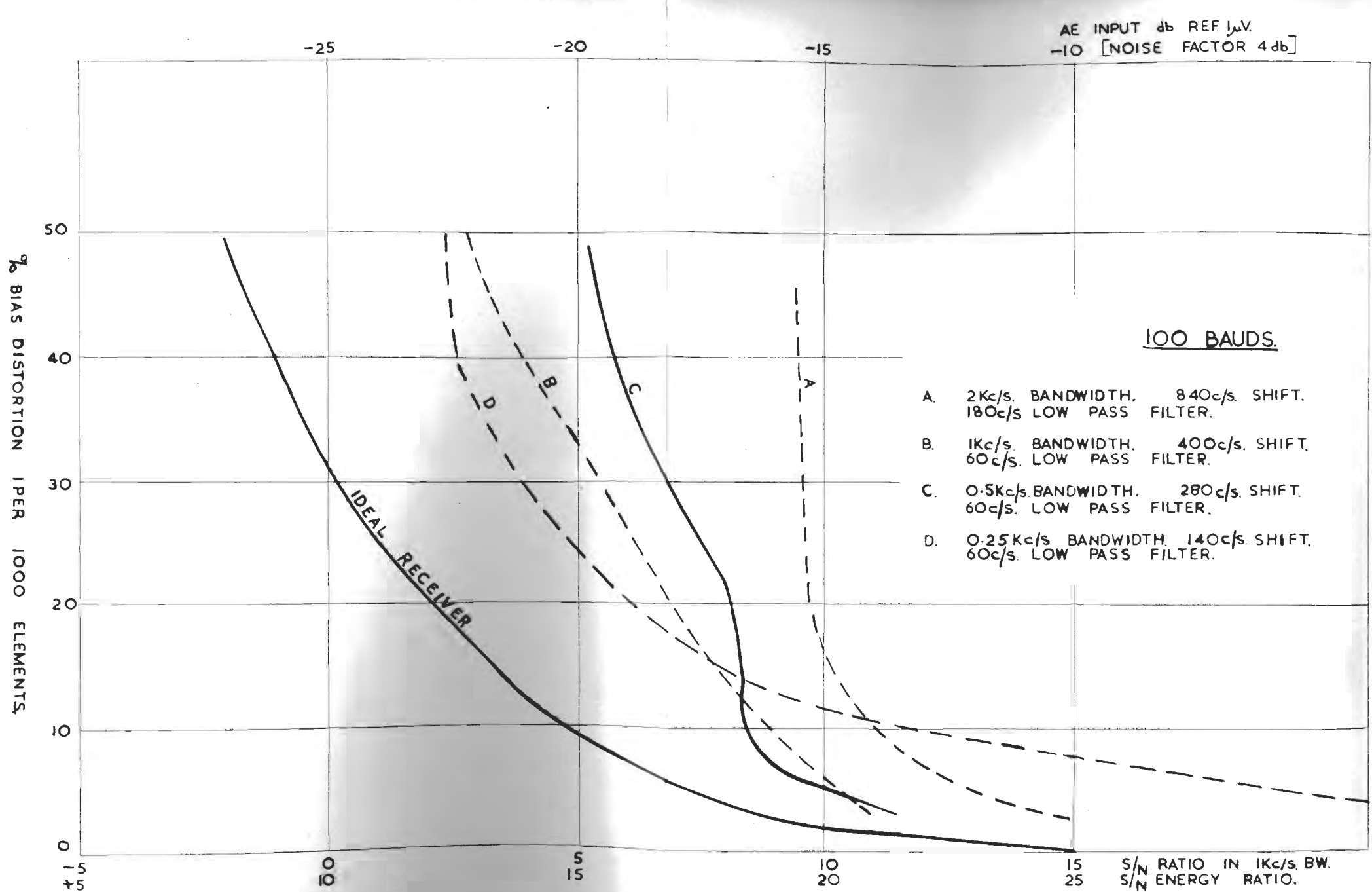
D.C. OUTPUT UNIT A.P. 102573

SUPPLY UNIT, STABILISED A.P. 102590.

SUPPLY UNIT AP. 102559.

CABLEFORMS ASSOCIATED WITH CABINETS

5995 - AP 103532
5995 - A.P. 103533
5995 - A.P. 103534.


AE INPUT db REF 1μV.
-25
-20
-15
-10 [NOISE FACTOR 4 db]
% BIAS DISTORTION IPER 1000 ELEMENTS.
50
40
30
20
10
0
IDEAL RECEIVER
A
B
C
D
100 BAUDS.
A. 2Kc/s. BANDWIDTH. 840c/s. SHIFT. 180c/s LOW PASS FILTER.
B. 1Kc/s. BANDWIDTH. 400c/s. SHIFT. 60c/s. LOW PASS FILTER.
C. 0·5Kc/s. BANDWIDTH. 280c/s. SHIFT. 60c/s. LOW PASS FILTER.
D. 0·25Kc/s BANDWIDTH. 140c/s. SHIFT. 60c/s. LOW PASS FILTER.
-5
+5
0
10
5
15
10
20
15
25
S/N RATIO IN 1Kc/s. BW.
S/N ENERGY RATIO.