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B.R.333(1) VOL.2

SUMMARIES OF DATA OF RADIO EQUIPMENT (SHIPS AND SHORE STATIONS)

(SUPERSEDES BR333(1) DATED 1950)

BY COMMAND OF THE DEFENCE COUNCIL

OCTOBER 1971

MINISTRY OF DEFENCE
DIRECTOR GENERAL WEAPONS (NAVAL)
(N/W63718/71)

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L.T. Dunnett

FOREWORD

1. The object of this book dated 1971 is to provide a short descriptive Summary of all non Confidential Radio Equipment in current use in ships, and in some cases jointly in shore stations. Equipments solely used ashore are summarised in BR 333(4).
2. The book is one of a series with titles as follows:-

BR 333(1) Vols. 1	Summaries of Data of Radio Equipment (Ships and
and 2	Shore Stations).
BR 333(2))
and)
AP 116A-0102-1) Concise Details of Radio Equipment (Airborne) Including
	Naval Air Radio Equipment.
BR 333(3)	Obsolete.
BR 333(4)	Summaries of Data of Telecommunication Equipment (Ashore).
3. Unless required in respect of some obsolescent equipment still in use, the superseded publication BR 333(1) dated 1950 should be destroyed in accordance with local arrangements for the disposal of Classified waste.
4. Additionally, reference may be made to Summaries in the following books:-
 - (a) BR 222 The User's Guide to Wireless Equipment.
 - (b) BR 1982 Warning Radar User Instructions.
5. Summaries of Data for Common Range Electrical Testing Equipment - CRETE - are given in BR 1781.

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Radar Pulse Synchronisation

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Plotting Systems
True Motion Outfits
Teacher Outfits
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Beacons
Satellite Communications

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(Radar Plot Information) Outfit RJT(1) and RJR(1)

True Motion Outfit QAA (see JUA3) (To be issued later)
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Teacher Outfit HRL(1)
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Radar Aerial Outfit AKR

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Radar Aerial Outfit AUK (see Types 277/293 Section 6)
Radar Aerial Outfit AZF (see Type 975 Section 6)
Radar Aerial Outfit AZG (see Type 975 Section 6)

Radar Aerial Outfit AZJ (see 1006) (To be issued later)
Radar Aerial Outfit AZK (see 1006) (To be issued later)
Radar Aerial Outfit AZR

S E C T I O N 6CONTENTS LIST

Transmitter-Receiver 77A

Radar Type 262R, 262(2)R, 262(6)R

Radar Type 277P/Q and 293P/Q

Radar Type 278 (with ANU) (with 986/987/993)

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Radar Type 944(1)

Radar Type 944(2)

Radar Type 944(M)(1)

Radar Type 944(M)(2)

Radar Type 954(1)(2)

Radar Type 954(M)(1)(2)

Radar Type 955

Radar Type 955M

Radar Type 957

Radar Type 960

Radar Type 963

Radar Type 965M/P

Radar Type 965Q/R

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Radar Type 993 (with AKD) (see 278)

Radar Type 1006 (To be issued later)

Radar Type 1010

Radar Type 1011 (1/2) (To be issued later)

SIF Outfit SND

Receiver Reply (Transponder) Outfit RRA

High Accuracy Receiver Outfit CEQ(1)(2)

Radar Pulse Synchronising Outfit RSD2

Radar Pulse Synchronising Outfit RSE

RESTRICTEDBR 333(1)
Original**TRANSMITTER-RECEIVER RADAR 77A****77A****SUMMARY OF DATA****PURPOSE**

Panel 77A is a submarine X-band Radar Transmitter and Receiver for use in conjunction with a P.P.I. and A-scan ranging display and the associated aerial outfits.

BRIEF DESCRIPTION

Panel 77A houses the transmitter and receiver which is used in the Radar Type 1000 series. It is connected either to the AKS Periscope aerial or to the AKJ, AKT or AKU Warning aerials, depending on the radar Type. The Periscope or Warning aerial is selected by the Waveguide Switch on the Control Unit. The waveguide system is entirely "pre-plumbed" and includes an echo-box for spectrum analysis, thermistor bridge for measuring mean output power, and a noise source for measuring the receiver noise factor. The receiver is fitted with A.F.C. and Swept Gain.

PERFORMANCE

Frequency:

Transmitter : 9650 MHz \pm 50 MHz
 Local Oscillator : 30 MHz less than transmitter frequency
 Intermediate : 30 MHz

Peak Power Output : 30 kW nominal, at outlet

Pulse Repetition Frequency: 400–500 Hz \emptyset
 or
 2000–2500 Hz *

Pulse Duration : 1 microsecond \emptyset
 or
 0.2 microsecond *

Receiver

Narrow Bandwidth : 2 MHz at -3 dB \emptyset
 Wide Bandwidth : 8 MHz at -3 dB *
 Noise Factor : not greater than 12 dB

MAJOR UNITS

(a) Cabinet Assembly Design 62, Control, AP 62167, containing:

- (1) Distribution Chassis Design 4, AP 63694
- (2) Amplifier Chassis 45T, I.F. AP62168/A
- (3) R.F. Power Meter Chassis, AP 62169/A
- (4) Mount with Thermistor, AP 62170
- (5) Amplifier Chassis Design 15, Echo Box, AP 62171

(b) Cabinet Assembly Design 63, R.F. AP 62172, two in number, containing:

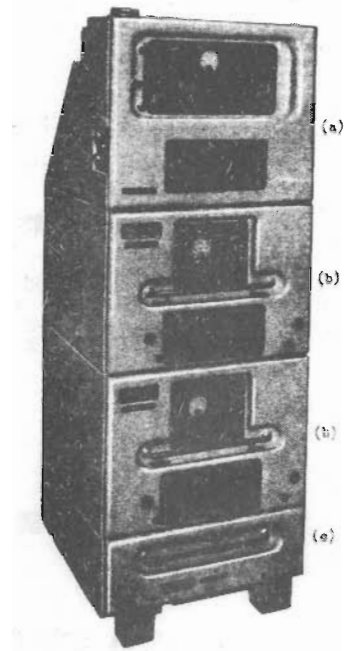
- (1) R.F. Drawer, AP 62173
- (2) Control and Monitor Unit Design 2 AP 65037
- (3) Pulse Generator Chassis, AP 62174
- (4) Modulator Chassis, AP 173287
- (5) Rectifier Chassis 63BC, 15 kV, AP 62176
- (6) T.R. Chassis Design 2, AP 62177
- (7) A.F.C. and Trigger Chassis, AP 62178
- (8) Timing Chassis, AP 62179
- (9) Pre-Amplifier Chassis, AP 62180

(c) Cabinet Assembly Design 64, Rectifier, AP 62181, containing:

- (1) Power Supply Drawer Design 8, AP 62182
- (2) Rectifier Chassis 63BD, AP 62183

(d) Waveguide Assembly Design 4, AP 62185

(e) Cable Unit, AP 62186

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ASSOCIATED AERIAL OUTFITS

Type 1000(1) Aerial Outfit AKS and AKJ
Type 1000(2) Aerial Outfit AKS and AKT
Type 1001 Aerial Outfit AKS and AKU

PHYSICAL DATA

Height 5 ft 2 in at front sloping to 3 ft 7 in at rear. Width is 1 ft 10½ in Depth is 2 ft
Weight complete: 950 pounds approx.

POWER REQUIREMENTS

180 V 500 Hz or 200 V 400 Hz @ 6 amps
and either
115 V 60 Hz or 230 V 50 Hz, maximum 0.5 amps
220 V d.c. @ 1 amp

HANDBOOK

BR 2942(1)(2)

ESTABLISHMENT LIST

E 1133

INSTALLATION SPECIFICATION

B 821

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Original**TYPES 262R, 262(2)R AND 262(6)R****262R****SUMMARY OF DATA****PURPOSE**

Associated radar set of either the C.R.B.F.D. Mk. 5 fitted as part of the Medium Range System Mk. 8 or G.W. Director Mk. 21, fitted as part of the Guided Weapon System Mk. 21.

On new installations, Type 262R is fitted in both a.c. and d.c. ships. When Type 262R Units are fitted in modified Type 262Q cubicles on d.c. ships the designation is Type 262(2)R, and on a.c. ships, Type 262(6)R.

BRIEF DESCRIPTION

Radar Type 262R, fitted in C.R.B.F.D. Mk. 5, is part of the M.R.S.8. The radar beam is very narrow and the set is therefore not suitable for all-round searching and detection of targets. Range and Bearing of the target to be engaged is provided by the Gun Direction System. Type 262R then searches a small amount in range, bearing, and elevation (range ± 750 yards about the mean range, bearing $\pm 5^\circ$, elevation at 5° per second). When the target is detected, the search stops automatically, the radar beam is locked-on to the target and the set provides auto ranging under all conditions of operation and auto-following as applicable.

The majority of the radar operating controls are on the Control Door. Certain controls are duplicated on the C.O.'s Console. It should be noted that the Auto-Radar Switch on the Control Door is at all times left in AUTO.

PERFORMANCE

Frequency	: 9580 - 9900 MHz
Wavelength	: 3.03 - 3.13 cm
Power Output	: Approximately 24 kW (peak)
Pulse Repetition Frequency	: 1500 pulses per second, or 1667 pulses per second
Pulse Duration	: 0.5 microsecond
Beam width	: 5.2° (6 dB down)
Intermediate Frequency	: 30 MHz
Receiver Bandwidth	: Greater than 3 MHz between 3 dB points

MAJOR UNITS

The units are housed in watertight cubicles as follows:-

Cubicle F1 -	1.	AP 172181	Cabinet, Control
	2.	AP 172165	Modulator Unit
	3.	AP 172161	Rectifier Unit
	4.	AP 172163	Servo Unit
	5.	AP 172162	Search Unit
Cubicle F2 -	6.	AP 172180	Control Door
	7.	AP 172164	Auto Strobe Unit
	8.	AP 172167	Cathode Ray Unit
Cubicle H -	9.	AP 172182	Cabinet, T/R
	10.	AP 172160	Transmitter-Receiver Unit
Cubicle J -	11.	AP 172183	Cabinet, R.T.U.
	12.	AP 172166	Range Transmitting Unit
Cubicle K -	13.	AP 172184	Cabinet, Blower
	14.	(a) AP 54208	Blower Unit for d.c. installations
		(b) AP 66753	Blower Unit for a.c. installations
	15.	AP 172168	Control Unit fitted as integral part of C.O.'s Console

AERIAL OUTFIT

Aerial Outfit APE(2) which consists of a parabolic reflector fed by a flare from the waveguide system. The aerial reflector rotates at 1800 r.p.m.

POWER REQUIREMENTS

440 V 60 Hz 3-phase for radar generator in a.c. ships.
220 V d.c. for radar generator in d.c. ships.

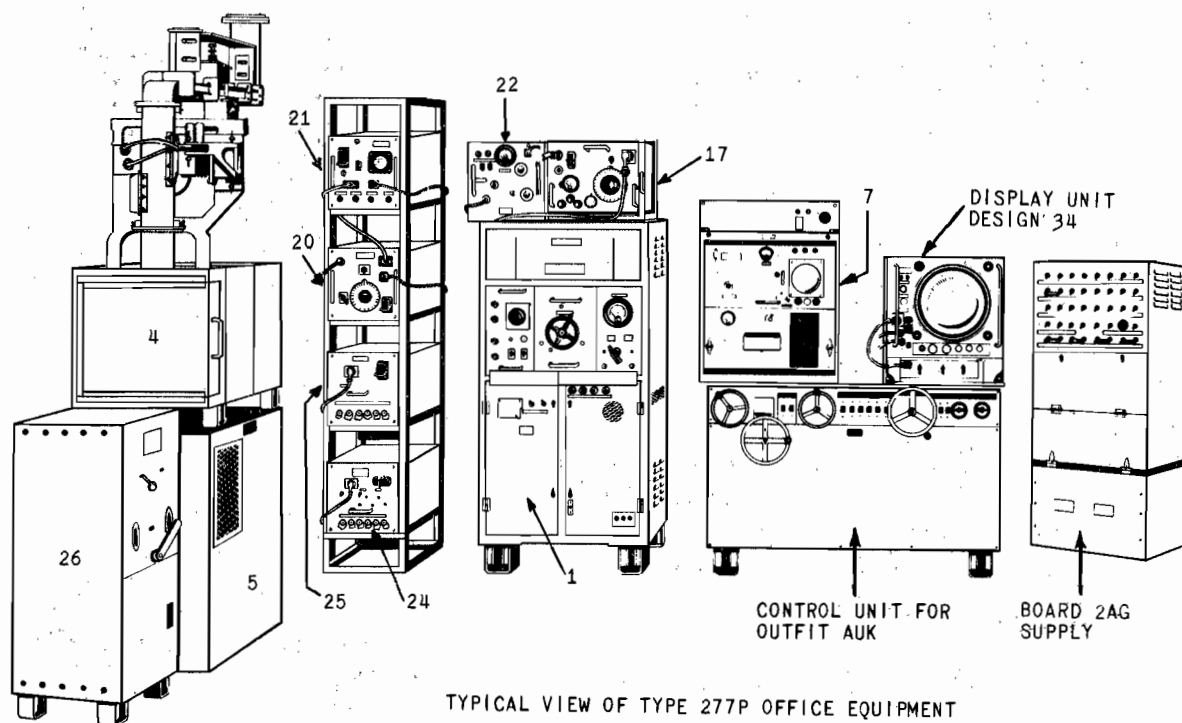
HANDBOOKS

BR 2302(A) and BR 2302(B) Series

ESTABLISHMENT LISTS

E 1281, E 1331

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Original**TYPES 277P/Q AND 293P/Q****277
293****SUMMARY OF DATA****PURPOSE**

Type 277P/Q provides facilities for height-finding and surface warning
 Type 293P/Q provides facilities for close range air and surface warning, with special application to Target Indication.

BRIEF DESCRIPTION

Types 277P/Q, 293P/Q are similar in all respects except for their aerial systems. Types 277P/Q are intended for accurate height-finding of targets indicated on other sets, the operation of height-finding being carried out, normally, on a Height Position Indicator. When a H.P.I. is not fitted or in an emergency an approximation can be obtained by elevating the aerial for maximum echo. Types 293P/Q are used for Target Indication, the bearing accuracy of these sets being very high. They can also be used, when fitted with Display Outfit UN, to train Types 277P/Q on to any target for height finding.

The radar office, besides containing the modulator, transmitter and receiver panels also contains a display outfit and aerial control unit although these are not normally used for operational purposes, control being from the R.D.R. Thus the office can be used as an emergency operating position except for height-finding as no H.P.I. is fitted in the Type 277P/Q office.

PERFORMANCE

Frequency	: 2940 MHz - 3060 MHz (9.8 Hz - 10.2 Hz)
Power Output	: 400 kW (peak)
Pulse Repetition Frequency	: 500 pulses per second
Beam width	: Type 277P with Aerial Outfit AUK 4.5° horizontal 4.5° vertical Type 277Q with Aerial Outfit ANU 4.5° horizontal 2.5° vertical Type 293Q with Aerial Outfit AQR 2.6° horizontal 30° vertical Type 293Q with Aerial Outfit ANS 2.0° horizontal 35° vertical
All beam widths are at half field strength.	
Pulse Length	: 0.7 or 1.0 Mhz
Intermediate Frequency	: 13.5 MHz
Receiver Bandwidth	: 4 MHz, 1 MHz or 0.5 MHz
Heat Dissipation	: 4.5 kW (approx.)

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MAJOR UNITS

- (a) Transmitter and Modulator
1. AP 66501B Panel 3CC Rectifying and Modulating
 2. AP 66502A Trigger Unit Design 10
 3. AP 25287A Wavemonitor G86
 4. AP W6177A Transmitter 9T
 5. AP W7556 Soundproof Cabinet for Blower
 6. AP W9253 Blower
- (b) Receiver Outfit CEL
7. AP 58363 Panel L53 (Receiving)
 8. AP 58222 Frequency Changer Unit Design 6
 9. AP 58234 Cathode Ray Unit Design 36
 10. AP 58396 I.F. Amplifier Design 7
 11. AP 58397 Cathode Follower Unit Design 12
 12. AP 58399 Control Unit Design 37
 13. AP 58395 Oscillator G225
 14. AP 58400 Meter Unit Design 4
 15. AP 57496 I.F. Amplifier Design 5
 16. AP 6811A Rectifier Unit S.E.6
- (c) Test Equipment
17. AP 53915 Wavemeter C93
 18. AP 56807 Standing Wave Ratio Indicator Design 4
 19. AP 66584 Meter Unit Field Strength (Waveguide)
 20. AP 66765 Spectrometer Cavity Resonator Unit
 21. AP 66766 Spectrometer Display Unit
 22. AP 66848 Signal Generator Noise
 23. AP 60980 S.W.R. Indicator Multi-neon
- (d) Miscellaneous Equipment
24. AP 53198 Cathode Follower Unit 6 way
 25. AP 53197 Cathode Follower Unit Design 5
 26. AP W8828/A Air Conditioning Unit Design S.E.2
 27. AP 58679 Board 2AR Changeover Design 2
 28. AP W9199 Matching Unit Adjustable Design A
 29. AP 56773 Aerial Matching Unit

NOTE: Test Equipment Items 20 and 21 are designed to replace Item 17, but are only issued for Types 293P/Q. Types 277P/Q will retain Item 17.

PHYSICAL DATA

Type 277P/Q

Weight of office equipment (Destroyers) 22½ cwt
 Weight of office equipment (Cruisers) 26½ cwt
 Dimensions of office - 11 ft by 7 ft divided into two sections

- (a) 6 ft by 7 ft containing Receiving equipment
- (b) 5 ft by 7 ft containing Transmitter equipment

Type 293P/Q

Weight of office equipment (Destroyers) 25 cwt
 Weight of office equipment (Cruisers) 23 cwt
 Weight of Amplidyne Generator and Starter (293Q) 3 cwt
 Dimension of office - 12 ft by 8 ft divided into two sections

- (a) 7 ft by 8 ft containing Receiving equipment
- (b) 7 ft by 8 ft containing Transmitting equipment

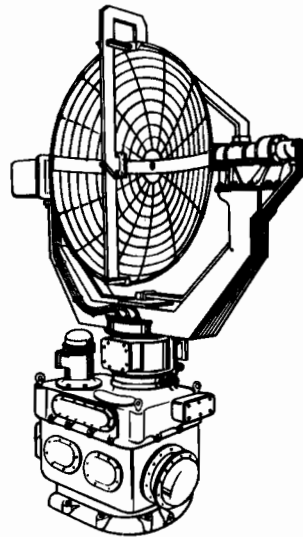
The Amplidyne Generator fitted with Type 293Q is 2 ft 11 ins long, 14½ ins wide and 1 ft 11 ins high and is sited outside but adjacent to Type 293Q office.

TEACHER OUTFIT

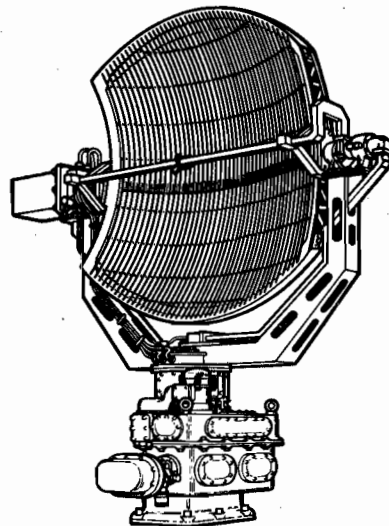
Teacher Outfit HRL

POWER REQUIREMENTS

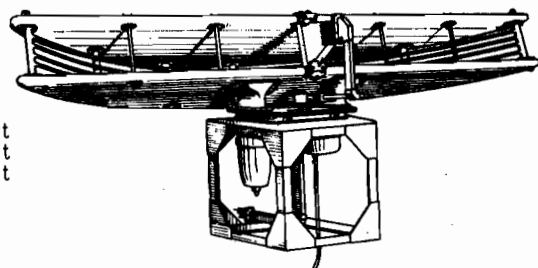
230 V 50 Hz 3 phase	24 V d.c.
180 V 500 Hz	50 V 50 Hz 3 phase
220 V d.c.	



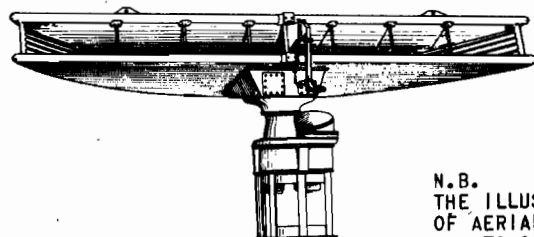
AERIAL OUTFIT AUK



AERIAL OUTFIT ANU



AERIAL OUTFIT AQR



AERIAL OUTFIT ANS

N.B.
 THE ILLUSTRATIONS
 OF AERIALS ARE
 NOT TO SCALE

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Original**277**
293**ASSOCIATED POWER SUPPLY OUTFITS**

<u>Frigates</u>		<u>Destroyers and Above</u>		<u>Ships fitted with Type 960</u>	
(a)	(b)	(a)	(b)	(a)	(b)
Type 277P/Q - DUC	DPF	DUG or DUE	DPL	DVH	From D.E.E. sources
Type 293P/Q - DUG	DPB	DUG or DUE	DPB	DVH	
Types 277P/Q - DUH					
and 293P/Q (a) 180 V 500 Hz (b) 230 V 50 Hz 3 phase					

ASSOCIATED AERIAL OUTFITS

Type 277P - Aerial Outfit AUK Type 277Q - Aerial Outfit ANU

Type 293P - Aerial Outfit AQR Type 293Q - Aerial Outfit ANS

(See separate Summary of Data Sheets)

HANDBOOK

BR 2106(1)(2)

ESTABLISHMENT LIST

E529 Types 277P/Q, 293P/Q

INSTALLATION SPECIFICATION

B626	Type 277P	B659	Type 277Q
B721	Type 293P	B721	Type 293Q

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Original**RADAR TYPES 278, 993, 986 AND 987****OFFICE EQUIPMENT****SUMMARY OF DATA****278****993****986****987****PURPOSE**

A general purpose receiver-transmitter complete in itself, intended to be associated with a wide range of aerial and display units to form a complete S-Band radar equipment.

BRIEF DESCRIPTION

The magnetron is driven by a hydrogen thyatron modulator, the pulse-forming network being locally or remotely switched to one of two pulse lengths; synchronisation can be internal or external. A pre-pulse output is available to trigger an I.F.F. interrogator on internal synchronisation only. The magnetron duplexer, local oscillator and its controls, are grouped in a single unit.

The receiver channel consists of a balanced crystal mixer feeding an i.f. pre-amplifier. Two linear and two logarithmic i.f. amplifiers are used, one linear and one logarithmic together for each of the two bandwidths. Relays, local or remote controlled, select the desired bandwidths. The linear i.f. amplifiers may be controlled by a sampling a.g.c. system and a swept gain waveform of variable amplitude and duration can also be applied. The logarithmic i.f. amplifiers feed one cathode follower and the linear i.f. amplifiers feed another. Both cathode followers are taken to a switch-bank which selects logarithmic or linear video output which is then taken through ten video cathode followers. Any combination of linear and logarithmic outputs is available, up to a total of ten. The local oscillator of the receiver is controlled by an electronic a.f.c. system with its own tuning meter.

Power supplies are self-contained and stabilised as required. The e.h.t. supply is also self-contained and is manually adjustable. A comprehensive interlock and electronic fault-protection system is incorporated.

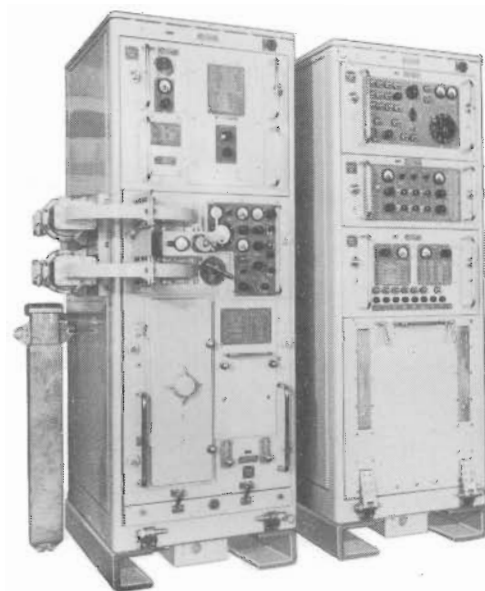
A waveguide switch is built in and enables the Receiver-Transmitter to be connected to an aerial, to an external dummy load, or to a built-in S-Band noise source for noise factor measurement.

Incorporated test facilities comprise, waveneter, i.f. step attenuator, calibrated directly in noise factor, and a r.f. power meter which may be switched to a radiated power monitor at the aerial head. Important voltages and currents are monitored from unit switch positions. The equipment houses a CT52 wavemonitor which displays selected unit waveforms, transmitter spectrum, a.f.c. discriminator curve and external I.F.F. video pulse.

PERFORMANCE

Power Output	: 600 kW peak nominal
Pulse Repetition Frequency	: (a) Internal Trigger 400 or 500 p/s (b) External Trigger 100 to 550 p/s
Pulse Length	: 0.5 μ s or 2.0 μ s
Receiver Bandwidth	: 0.85 MHz or 3.0 MHz switched.
Intermediate Frequency	: 30 MHz
Basic Composition of Each Type	

TYPE	AERIAL OUTFIT	PEDESTAL UNIT	AERIAL CONTROL UNIT	OFFICE EQUIPMENT
278(1)	ANU(1)	AP 67541A	AP 65743B) AP 173047 Cabinet Radar
278(2)	ANU(2)	AP 64620	AP 70210	
278(3)	ANU(3)	AP 67541B	AP 65743B	
278(4)	ANU(4)	AP 64620	AP 70210	
278(5)	ANU(5)	AP 186065	AP 186054) AP 173050 Cabinet Power and Video
278(6)	ANU(6)	AP 64620	AP 186054	
993	AKD	AP 186208	AP 186365	
986	AKR	AP 62254	AP 57592	
987	AQT	AP 65128	AP 57592	



CABINET RADAR AND
CABINET POWER AND VIDEO

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- Outputs for Display Units : (a) Video output - ten channels +5 V peak into 68 ohms
(b) Trigger output - single coaxial line into standard AP junction box giving ten outputs, each +10 V peak into 68 ohms, coincident with transmitted pulse.
- Triggers for External Equipment : (a) I.F.F. pre-pulse 36.5 μ s before transmitted pulse, +15 V peak into 68 ohms, 1 μ s duration.
(b) Monitor pre-pulse 2 to 4 μ s before transmitted pulse, 13 V \pm 5 V peak into 68 ohms, 1 μ s duration.

MAJOR UNITS

			Physical Data			
			Height	Width	Depth	Weight
1.	5840-173049	Modulator	18 in	22 in	27 in	192 lb
2.	5840-173048	Receiver-Transmitter	38 in	22 in	27 in	364 lb
3.	5840-173056	Tuning Unit R.F. (3 in No.)	21½ in	6½ in	17 in	50 lb
4.	5840-173052	Control, Power Supply	9½ in	22 in	27 in	106 lb
5.	5840-173051	Amplifier I.F. and Video	12 in	22 in	27 in	68 lb
6.	5840-173054	Power Supply	12 in	22 in	27 in	147 lb
7.	5840-173053	Power Supply E.H.T.	19½ in	19½ in	22 in	211 lb
8.	5840-173047	Cabinet Radar	72 in	24 in	30 in	350 lb
9.	5840-173050	Cabinet Power and Video	72 in	24 in	30 in	435 lb

Items 1-3 are part of Item 8.

Items 4-7 are part of Item 9.

POWER REQUIREMENTS AND CONSUMPTION

440 V, 3 phase, 50-60 Hz 3.2 kVA.

Anti-condensation heaters 115 V a.c. or 220 V d.c., 200 VA

VENTILATION

An external forced air supply of 650 cu. ft/min. at 1 inch water gauge and maximum inlet temperature 46 °C. is required.

HANDBOOK

BR 2358(1)(2)

ESTABLISHMENT LIST

E 1280

INSTALLATION SPECIFICATION

B900

RESTRICTED

TYPE 944(1)

944(1)

SUMMARY OF DATA

PURPOSE

I.F.F. Mk. 10 Interrogator fitted in conjunction with Type 960.

BRIEF DESCRIPTION

The Mark 10 system of I.F.F. is a pulsed secondary radar in which a signal transmitted from an interrogator in the ship is received by a transponder fitted in the craft under observation. The transponder then sends back an appropriate reply which is detected by the receiving part of the interrogator and distributed for display. Three "modes" of operation are available for general, personal and functional identification.

In the Type 944(1) the interrogator transmitter is triggered by the Type 960 Master Trigger Unit, the aerial is included in the Type 960 aerial assembly and rotates with it and the I.F.F. responses are displayed on the Type 960 displays. The Coder-Decoder selects the required "mode" of I.F.F. by remote control from Mixer Control Units fitted at remote display positions. The main items of equipment are fitted in the Type 960 office.

FREQUENCY

1030 MHz Transmission
1039 MHz Reception

WAVELENGTH

29.12 cm Transmission
27.52 cm Reception

POWER OUTPUT

1 kw approximately

PULSE REPETITION FREQUENCY

250 pulses per second (from Master Trigger Unit)

PULSE LENGTH

1 microsecond approx. from transmitter, lengthened to 4.5 microseconds approx. for display.

INTERMEDIATE FREQUENCY

59.9 MHz

RECEIVER BANDWIDTH

8 MHz to 11 MHz at 6 dB down.

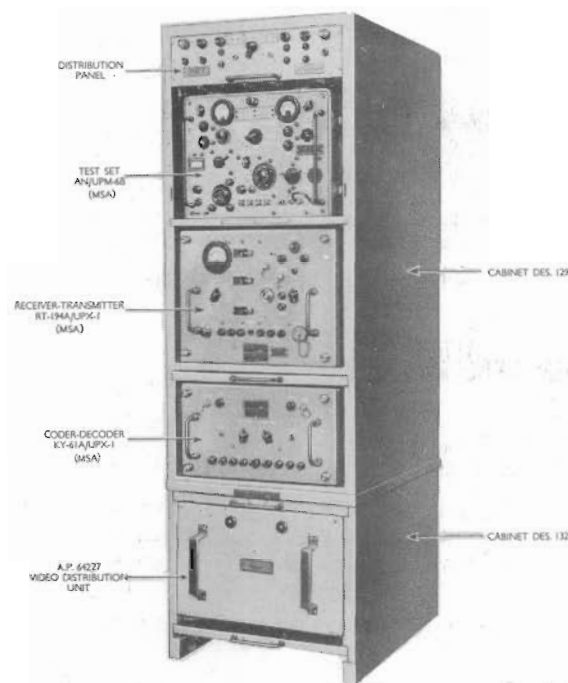
BEAM WIDTH

7 degrees at half power points.

MAJOR UNITS

(a) American Items

- | | | |
|-------|--|-----------------------------|
| (i) | Receiver-Transmitter RT-194A/UPX-1(MSA) | } Part of AN/UPX-1A(MSA) |
| (ii) | Coder-Decoder KY-61A/UPX-1(MSA) | |
| (iii) | Interrogator Antenna AT-352/UPA-22A(MSA) | } Part of Aerial Outfit AMB |
| (iv) | Test Antenna AS-177/UPX(MSA) | |
| (v) | Test Set AN/UPM-6B(MSA) | |



TYPE 944 (1) CABINETS
(GENERAL VIEW)

RESTRICTED

(b) British Items. The following items of British design are collectively known as Accessory Outfit FFA:

- (i) AP 64221 Cabinet Design 129
- (ii) AP 64224 Cabinet Design 132
- (iii) AP 64227 Video Distribution Unit (1 or 2 in No.)
- (iv) AP 64239 Pulse Lengthening Unit Design 2
- (v) AP 64236 Tray, Servicing, with Runners
- (vi) AP 64235 Tray, Servicing (2 in No.)
- (vii) AP 64228 Mixer Control Unit (All modes) } (No. as required)
- (viii) AP 64229 Mixer Control Unit Design 2 }
- (ix) AP 64237 Box, with Terminating Resistors

PHYSICAL DATA

Office Equipment Height 6 ft Width 22 in Depth 28 in Weight 600 lb

ASSOCIATED AERIAL OUTFIT

Aerial Outfit AMB (part of Type 944(1)), comprising:

Interrogator Antenna AT-352/UPA-22A(MSA)
Test Antenna AS-177/UPX(MSA)

NOTE: The Interrogator antenna is fitted as an integral part of the Type 960 aerial AQQ(2) and AQQ(3).

POWER REQUIREMENTS

115 V 50/60 Hz single phase 750 watts
220/230 V d.c. or a.c. 210 watts
24 V d.c. 100 watts

Extra for additional Video Distribution Unit:

115 V 50/60 Hz single phase 185 watts
220/230 V d.c. or a.c. 45 watts

Heat Dissipation in Office 1 kW approx.

REMARKS

The main items of interrogator equipment, although made in the United Kingdom, are of American design and have been supplied under the Mutual Defence Aid Programme. The video distribution unit and other items necessary to link the I.F.F. Mk. 10 System with British radars have been designed in the United Kingdom.

HANDBOOK

BR 2174

ESTABLISHMENT LIST

E 1127

INSTALLATION SPECIFICATIONS

B831 Type 944(1)
B827 Aerial Outfits AQQ and AMB

RESTRICTED

RESTRICTEDBR 333(1)
Original**TYPE 944(2)****944(2)****SUMMARY OF DATA****PURPOSE**

I.F.F. Mk. 10 interrogator co-ordinated with Types 277/293.

BRIEF DESCRIPTION

The Mark 10 I.F.F. System is a pulsed secondary radar in which a signal transmitted from an interrogator in the ship is received by a transponder fitted in the craft under observation. The transponder then sends back an appropriate reply which is detected by the receiving part of the interrogator and distributed for display. Three 'modes' of operation are available for general, personal and functional identification.

Type 944(2) comprises (a) I.F.F. Mk.110 co-ordinated with radar Types 277 or 293 or (b) unco-ordinated. In (a) the I.F.F. aerial rotation is co-ordinated with that of the main air-warning radar and the I.F.F. responses are superimposed on the radar video to provide a mixed display. In (b) the I.F.F. interrogator is completely independent, having its own exclusive display arrangements.

FREQUENCY

1030 MHz Transmission
1090 MHz Reception

POWER OUTPUT

1 kW approximately

PULSE REPETITION FREQUENCY

Co-ordinated - 250 pulses per second
(from radar trigger unit)
Unco-ordinated - 400 pulses per second.

PULSE LENGTH

1 μ s approximately from transmitter, lengthened to 4.5 μ s approximately for display

INTERMEDIATE FREQUENCY

59.5 MHz

RECEIVER BANDWIDTH

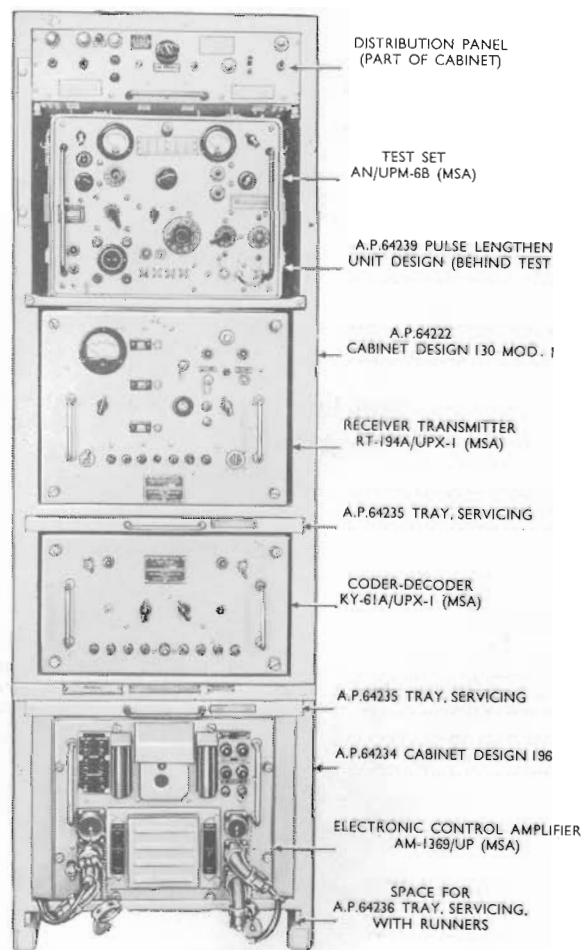
8 MHz to 11 MHz at 6 dB down.

BEAM WIDTH

14 degrees at half-power points.

MAJOR UNITS**(a) American Items**

- | | |
|---|--|
| (i) Receiver-Transmitter RT-194A/UPX-1 (MSA) | } Part of
AN/UPX-1A (MSA) |
| (ii) Coder-Decoder KY-61A/UPX (MSA) | |
| (iii) Electronic Control Amplifier AM-1369/UP (MSA) | } Part of
AN/UPA-23A (MSA)
Aerial Outfit (AMC) |
| (iv) Antenna AT-353A/UPA-23A (MSA) | |
| (v) Antenna Pedestal AB-447/UP (MSA) | |
| (vi) Motor Generator PU-343/U (MSA) | |
| (vii) Test Set AN/UPM-6B (MSA) | |

**INTERROGATOR CABINET EQUIPMENT****RESTRICTED**

RESTRICTED

(b) British Items

The following items of British design are collectively known as Accessory Outfit FFB:-

- (i) AP 64222 Cabinet Design 130
- (ii) AP 64234 Cabinet Design 196
- (iii) AP 64239 Pulse Lengthening Unit Design 2
- (iv) AP 64235 Tray Servicing (2 in number)
- (v) AP 64236 Tray Servicing with runners
- {vi) AP 64228 Mixer Control Unit (all Modes) }
- {vii) AP 64229 Mixer Unit Design 2 } No. as required
- (viii) AP 64237 Box, with Terminating Resistors
- (ix) AP 64238 Aerial Control Unit 41B (Part of Aerial Outfit AMC)

ASSOCIATED AERIAL OUTFIT

Aerial Outfit AMC (Part of Type 944(2)).

PHYSICAL DATA

	Height	Width	Depth	Weight
Cabinets	6 ft	1 ft 10 in	2 ft 4 in	550 lb
Aerial Control Unit	1 ft	1 ft 1 in	1 ft	50 lb
Motor Generator	1 ft 4 in	10 in	2 ft 1 in	155 lb
Aerial and Pedestal	-	-	-	210 lb

POWER REQUIREMENTS

115 V 50/60 Hz single phase main supply 2.5 kVA (9 kVA for 0.6 sec. during start up of aerial system)

115/220/230 V d.c. or a.c. 210 W for anti-condensation heaters

24 V d.c. 40 W for mixer units

In unco-ordinated installations, additional for aerial control unit:

115 V 50/60 Hz single phase 50 W

24 V d.c. 50 W

Heat dissipation in office 1 kW approx.

REMARKS

The main items of interrogator equipment although made in the United Kingdom, are of American design and have been supplied under the Mutual Defence Aid Programme. The items necessary to link the I.F.F. Mk. 10 System with British radars have been designed in the United Kingdom.

HANDBOOK

BR 1379

ESTABLISHMENT LIST

E 1127

INSTALLATION SPECIFICATION

B 833

RESTRICTED

RESTRICTEDBR 333(1)
Original

TYPE 944M(1)

944M(1)

SUMMARY OF DATA**PURPOSE**

I.F.F. Mark 10 interrogator with Selective identification Feature (S.I.F.) Integrated with Radar Types 960 or 965M

BRIEF DESCRIPTION

The Mark 10 system of I.F.F. with S.I.F. is a pulsed secondary radar in which a signal transmitted from an Interrogator in the ship is received by a transponder in the craft under observation. The transponder then sends back a reply in the form of a coded pulse train for each interrogation. This is detected by the receiving part of the interrogator and then converted to a single pulse by S.I.F. decoders and distributed for display. The equipment may be switched to basic operation if required when the S.I.F. decoding circuits will be by-passed. Three modes of operation are available.

In the case of Type 944(1) the interrogator transmitter is triggered by the Type 960 or Type 965M trigger unit, the aerial is mounted on the radar aerial and rotates with it and the I.F.F. responses are displayed on the radar displays. Mixer Control Units are fitted adjacent to each display by means of which the operator can set the mode and S.I.F. code required. The main items of equipment are fitted in the radar office. S.I.F. Decoders are fitted in cabinets in or adjacent to display rooms.

FREQUENCY

1030 MHz Transmission
1090 MHz Reception

POWER OUTPUT

1 kW approximately

PULSE REPETITION FREQUENCY

(Pulses per second)
250 from Type 960 Master Trigger Unit
380 or 190 from Type 965M External Trigger Unit

PULSE DURATION

Transmitter - 1 microsecond
Reply (decoded) - 0.75 microsecond pulse
lengthened to 4.0 microsecond approximately for display.

INTERMEDIATE FREQUENCY

59.5 MHz

RECEIVER BANDWIDTH

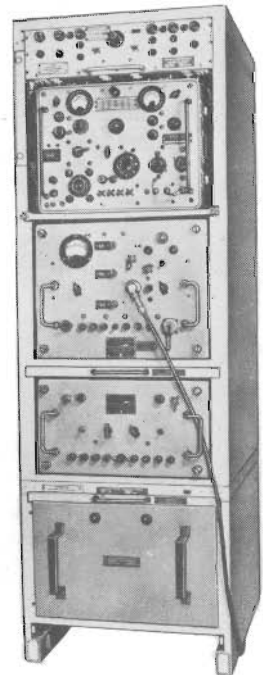
8 MHz to 11 MHz at 6 dB down.

AERIAL BEAM WIDTH

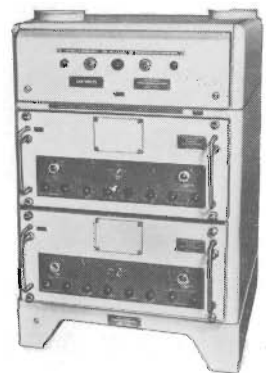
7 degrees at half-power points.

MAJOR UNITS(a) Items of American Design.

- | | | |
|-------|--|---|
| (i) | Receiver-Transmitter RT-194A/UPX-1 (MSA) | } Part of Radar Recognition Set AN/UPX-1A (MSA) |
| (ii) | Coder-Decoder KY-61A/UPX-1 (MSA) | |
| (iii) | Radar Test Set AN/UPM-6B (MSA) | |



INTERROGATOR CABINET



2 - DECODER CABINET

RESTRICTED

RESTRICTED

(b) Accessory Outfit FFA

	Pattern No.	Description	Remarks
(i)	64221	Cabinet Design 129 Mod. 1	
(ii)	64224	Cabinet Design 132	
(iii)	64227	Video Distribution Unit	
(iv)	64229	Mixer Control Unit Design 2	Numbers vary with installation.

(c) S.I.F. Outfit SNA

(i)	5895-AP 164334	Decoder, Passive	Numbers vary with installation
(ii)	5895-AP 164340	Stand, Cabinet Mounting	
(iii)	5895-AP 164341	Cabinet, Distribution Section	
(iv)	5895-AP 164342	Cabinet, 2 Decoder Section	
(v)	5895-AP 164343	Cabinet, 3 Decoder Section	
(vi)	5895-AP 164338	Mixer Control Unit (All Modes)	
(vii)	5895-AP 164336	Decoder, Distress	
(viii)	5895-AP 164335	Control, Coder, Mode 1	
(ix)	5895-AP 164337	Coder, Transponder (Supplied for use as a Test Set)	

PHYSICAL DATA

	Height	Width	Depth	Weight (approx.)
Interrogator Equipment in Cabinet	6 ft 0 in	22 in	28 in	600 lb
Cabinets with Decoders:				
2 Decoders	3 ft 6 in	22 in	26 in	285 lb
3 Decoders	4 ft 10 in	22 in	26 in	385 lb
4 Decoders	5 ft 2 in	22 in	26 in	500 lb
5 Decoders	6 ft 0 in	22 in	26 in	600 lb

POWER REQUIREMENTS

	115V 50/60 Hz Single Phase	115 or 220V for heaters	24V D.C.
Interrogator Cabinet	670 watts	210 watts (220V only)	0.1A + 0.35A for each passive decoder and M.C.U. (all Modes) combined.
Decoder Passive Mode 1	200 VA (the supply can also be 230 V)	30 watts	0.05A
Decoder, Distress	70 VA	10 watts	0.05A
Decoder Cabinet, for each Decoder, Passive	200 VA (the supply can also be 230 V)	30 watts	
Coder, Transponder Test Set	50 VA		
Additional V.D.U.	185 watts	45 watts	

Heat dissipation in office 1 kW approximately.

ASSOCIATED AERIAL OUTFIT

Aerial Outfit AMB, comprising interrogator Antenna AT-352/UPA-22A (MSA) Test Antenna AS-177/UPX (MSA) (with Type 960 only).

REMARKS

The main items of interrogator equipment are of American design, although manufactured in the United Kingdom under the Mutual Security Aid (MSA) agreement. Cabinets, S.I.F. decoders and items necessary to link the I.F.F. Mark 10 system with British radars are of British design and manufacture.

HANDBOOK

BR 2330

ESTABLISHMENT LISTS

Type 944M(1)	E1127
Outfit AMB	E1171
Outfit FFA	E1172
Outfit SNA	E1262
Test Set AN/UPM-6B (MSA)	AE25

INSTALLATION SPECIFICATION

B831

RESTRICTED

TYPE 944M(2)

944M(2)

SUMMARY OF DATA

PURPOSE

I.F.F. Mark 10 interrogator with selective identification feature (S.I.F.), co-ordinated with primary radar, or unco-ordinated.

BRIEF DESCRIPTION

The Mark 10 system of I.F.F. with S.I.F. is a pulsed secondary radar in which a signal transmitted from an interrogator in the ship is received by a transponder in the craft under observation. The transponder then sends back a reply in the form of a coded pulse train for each interrogation. This is detected by the receiving part of the interrogator and then converted to a single pulse by S.I.F. decoders and distributed for display. The equipment may be switched to basic operation if required, when the S.I.F. decoding circuits will be by-passed. Three modes of operation are available.

Type 944M(2) comprises (a) I.F.F. Mark 10 co-ordinated with a primary radar or (b) unco-ordinated. In (a) the I.F.F. aerial rotation is co-ordinated with the radar aerial rotation, and the I.F.F. responses are superimposed on the radar video to provide a mixed display. In (b) the I.F.F. interrogator is completely independent, having its own exclusive display arrangements.

FREQUENCY

1030 MHz transmission.
1090 MHz reception.

POWER OUTPUT

1 kW approximately.

PULSE REPETITION FREQUENCY

Co-ordinated - the nearest sub-multiple of the radar p.r.f. below 400 (e.g. 250 pulses per second for a 500 Hz radar).
Unco-ordinated - 400 pulses per second.

PULSE DURATION

1 μ s from transmitter. Reply (decoded) 0.75 μ s pulse lengthened to 4.0 μ s approximately for display.

INTERMEDIATE FREQUENCY

59.5 MHz

RECEIVER BANDWIDTH

8 MHz to 11 MHz at 6 dB down.

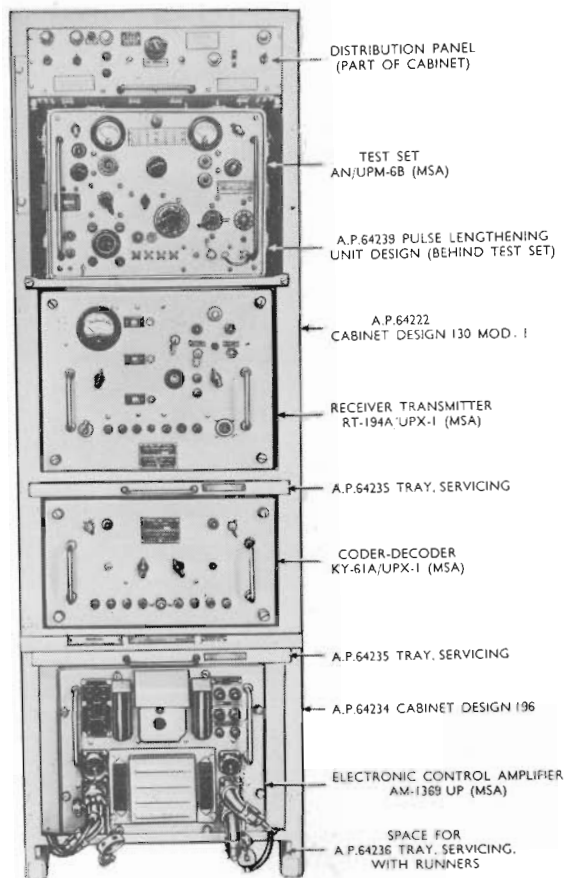
AERIAL BEAM WIDTH

14 degrees at half-power points.

MAJOR UNITS

Items of American Design

- | | |
|--|---|
| 1. Receiver-Transmitter RT-194A/UPX-1(MSA) | } Part of Radar Recognition Set AN/UPX-1A (MSA) |
| 2. Coder-Decoder KY-61A/UPX-1 (MSA) | |
| 3. Radar Test Set AN/UPM-6B (MSA) | |



INTERROGATOR CABINET EQUIPMENT

RESTRICTED

Accessory Outfit FFB

Pattern No.	Description	Remarks
1. 64222	Cabinet Design 130 Mod. 1	Numbers vary with installation. Unco-ordinated installations only. Only when more than five displays are required to show I.F.F. signals.
2. 64234	Cabinet Design 196	
3. 64229	Mixer Control Unit Design 2	
4. 64238	Aerial Control Unit 41B	
5. 64227	Video distribution Unit	

S.I.F. Outfit SNA

1. 5895-AP 164334	Decoder, Passive	Numbers vary with installation
2. 5895-AP 164340	Stand, Cabinet Mounting	
3. 5895-AP 164341	Cabinet, distribution Section	
4. 5895-AP 164342	Cabinet, 2 Decoder Section	
5. 5895-AP 164343	Cabinet, 3 Decoder Section	
6. 5895-AP 164338	Mixer Control Unit (All Modes)	
7. 5895-AP 164336	Decoder, Distress	
8. 5895-AP 164335	Control, Coder, Mode 1	
9. 5895-AP 164337	Coder, Transponder (Supplied for use as a Test Set)	

PHYSICAL DATA

	Height	Width	Depth	Weight
Interrogator Cabinet with equipment	6 ft	22 in	28 in	550 lb
Aerial Control Unit 41B	12 in	13 in	12 in	50 lb
Motor Generator	16 in	10 in	25 in	155 lb
Aerial, with pedestal	-	-	-	210 lb
Cabinets with S.I.F. decoders				
2 decoders	3 ft 6 in	22 in	26 in	285 lb
3 decoders	4 ft 10 in	22 in	26 in	385 lb
4 decoders	5 ft 2 in	22 in	26 in	500 lb
5 decoders	6 ft 0 in	22 in	26 in	600 lb

POWER REQUIREMENTS

	115 V, 50/60 Hz Single Phase	115 or 220 V for heaters	24 V d.c.
Interrogator Cabinets complete	2.5 kW (9.25 kW starting)	250 watts	0.1A + 0.35A for each passive decoder and M.C.U.
Decoder, Passive Mode 1	200 VA (the supply can also be 230 V)	30 watts	0.05A
Decoder, Distress	70 VA	10 watts	0.05A
Decoder Cabinet, for each Decoder, Passive	200 VA (the supply can also be 230 V)	30 watts	
Aerial Control Unit 41B (when fitted)	50 watts	45 watts	50 watts
Video Distribution Unit (when fitted)	185 watts	45 watts	
Coder, Transponder Test Set	50 VA		

Heat dissipation in office 1 kW approximately

REMARKS

The main items of interrogator equipment are of American design, although manufactured in the United Kingdom under the Mutual Security Aid (MSA) agreement. Cabinets, S.I.F. decoders and items necessary to link the I.F.F. Mark 10 system with British radars are of British design and manufacture.

HANDBOOK

BR 2355

ESTABLISHMENT LISTS

Type 944M(2)	E1127
Outfit AMC	E1171
Outfit FFB	E1172
Outfit SNA	E1262
Test Set AN/UPM-6N(MSA)	AE25

ASSOCIATED AERIAL OUTFIT

Aerial Outfit AMC or AME.

INSTALLATION SPECIFICATION

B833

RESTRICTED

TYPES 954(1) AND 954(2)

954

SUMMARY OF DATA

PURPOSE

I.F.F. Mark 10 Transponder for replying to I.F.F. Mark 10 Interrogators.

BRIEF DESCRIPTION

Types 954(1) and 954(2) are the shipborne transponders for replying to I.F.F. Mark 10 interrogators. Both sets employ the same items of transponder equipment, but Type 954(2) includes Test Set AN/UPM-6B (MSA) in addition and is fitted in cases where it is not possible to utilise the test set provided with Types 944(1) or 944(2). In Type 954(1) the test set space is available for additional units which may be fitted at a later date.

The interrogations are received as pulse pairs on a frequency of 1030 MHz. These interrogations are converted to video signals in the Receiver-Transmitter RT-269/UPX-5 from whence they are passed to the Decoder KY-88/UPX-5 which generates a single pulse for each correct interrogation. These pulses are fed to the modulator of the transmitter, the output of which is fed to the antenna and radiated on 1090 MHz as replies to the interrogations.

FREQUENCY

1030 MHz Reception
1090 MHz Transmission

POWER OUTPUT

300 W (peak) approximately

PULSE REPETITION FREQUENCY

Up to 4000 p/s (depending on interrogator).

PULSE LENGTH

1 microsecond approximately.

INTERMEDIATE FREQUENCY

59.5 MHz

RECEIVER BANDWIDTH

8 MHz to 11 MHz at 6 dB down.

BEAM WIDTH

Omni-directional

MAJOR UNITS

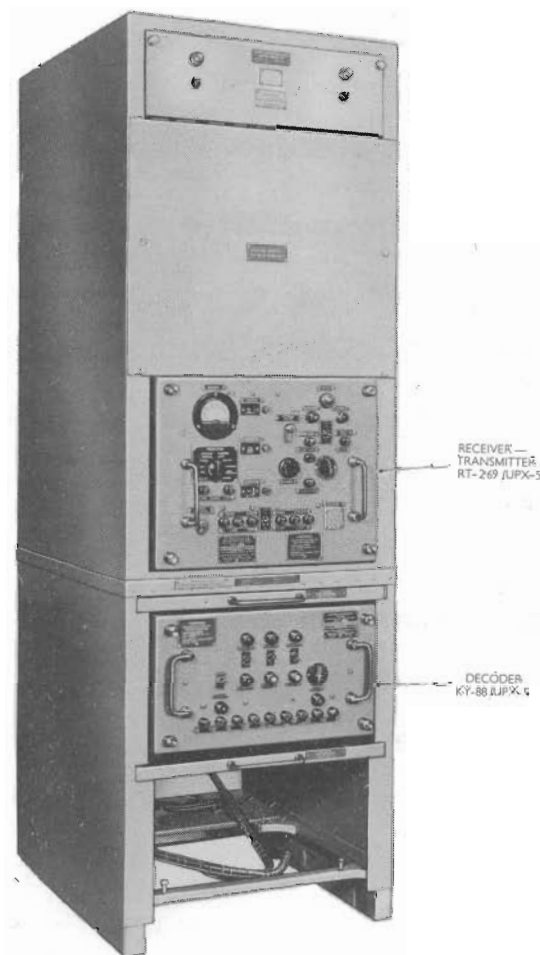
(a) American Items

- | | | |
|-------|---|--------------------------|
| (i) | Receiver-Transmitter RT-269/UPX-5 (MSA) | } Part of AN/UPX-5 (MSA) |
| (ii) | Decoder KY-88/UPX-5 (MSA) | |
| (iii) | Radar Set Control C-1076/UPX-5 (MSA) | |

- | | | |
|------|---------------------------|---------------------------|
| (iv) | Antenna AS-177/UPX (MSA). | Part of Aerial Outfit AMA |
| (v) | Test Set AN/UPM-6B (MSA). | (Type 954(2) only) |

(b) British Items

- | | | |
|------|-----------------------------|--------------------------------|
| (i) | AP 64223 Cabinet Design 131 | } Part of Accessory Outfit FFC |
| (ii) | AP 64225 Cabinet Design 133 | |



TYPE 954(1) CABINETS
(GENERAL VIEW)

RESTRICTED

PHYSICAL DATA

Office Equipment Height 6 ft Width 22 in Depth 28 in Weight 600 lb

ASSOCIATED AERIAL OUTFIT

Aerial Outfit AMA (Antenna AS-177/UPX (MSA))

POWER REQUIREMENTS

115 V 50/60 Hz single phase 750 watts }
115/220/230 V d.c. or a.c. 350 watts } These figures allow for fitting of future equipment.

HEAT DISSIPATION IN OFFICE

750 W approximately.

REMARKS

The main items of transponder equipment, although made in the United Kingdom, are of American design and have been supplied under the Mutual Defence Aid Programme. The cabinets for housing the office equipment have been designed in the United Kingdom.

HANDBOOK

BR 2134

ESTABLISHMENT LIST

E 1128

INSTALLATION SPECIFICATION

B832 Type 954(1) and (2) and Aerial Outfit AMA.

RESTRICTED

RESTRICTEDBR 333(1)
Original**TYPES 954M(1) AND 954M(2)****954M(1)**
954M(2)**SUMMARY OF DATA****PURPOSE**

I.F.F. Mark 10 Transponder with Selective Identification Feature (S.I.F.).

BRIEF DESCRIPTION

Types 954M(1) and (2) are shipborne transponders for replying to I.F.F. Mark 10 interrogators. Both sets employ the same items of transponder equipment, but Type 954M(2) includes Radar Test Set AN/UPM-6B (MSA) in addition and is fitted in cases where it is not possible to utilise the test set provided with I.F.F. Mark 10 interrogators Types 944M(1) or 944M(2). In the case of Type 954M(1) two items of S.I.F. equipment belonging to the interrogator are fitted in the cabinet for convenience.

The interrogations are received as pulse-pairs on a frequency of 1030 MHz. These interrogations are converted to video signals in the receiver-transmitter from whence they are passed to Coder-Decoder KY-88/UPX-5 which generates a single pulse for each correct interrogation. These pulses are fed to the S.I.F. Coder, Transponder which generates a coded pulse train for each pulse fed in. The coded pulse trains are fed to the modulator of the transmitter, the output of which is fed to the antenna and radiated on 1090 MHz as replies to the interrogations. The equipment may be switched to basic operation if required, when the S.I.F. coding circuits will be by-passed and the antenna will radiate one pulse for each pulse-pair received.

FREQUENCY

1030 MHz Reception 1090 MHz Transmission.

POWER OUTPUT

300 W (peak) approximately.

PULSE REPETITION FREQUENCY

Up to 4000 pulses per second (depending on interrogation rate).

PULSE DURATION

0.5 μ s (the transponder normally transmits a train of pulse).

INTERMEDIATE FREQUENCY

59.5 MHz

RECEIVER BANDWIDTH

8 MHz to 11 MHz at 6 dB down.

AERIAL BEAM WIDTH

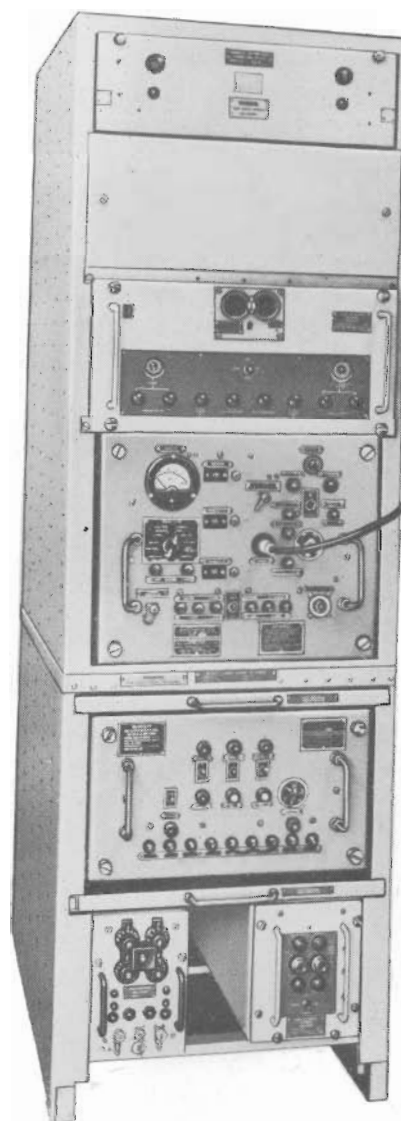
Omni-directional.

HEAT DISSIPATION IN OFFICE

750 W approximately

ASSOCIATED AERIAL OUTFIT

AMA, comprising Antenna AS-177/UPX (MSA).



TYPE 954M(1)

RESTRICTED

RESTRICTED

MAJOR UNITS

(a) TYPE 954M(1)

- | | | | |
|-------|---|---|---|
| (i) | Receiver-Transmitter RT-269/UPX-5 (MSA) | } | Part of Radar Identification Set AN/UPX-5 (MSA) |
| (ii) | Coder-Decoder KY-88/UPX-5 (MSA) Mod. 1 | | |
| (iii) | Radar Set control C-1076/UPX-5 (MSA) | | |
| (iv) | 5895-AP 164237 Cabinet, Transponder (Upper) | } | Accessory Outfit FFC |
| (v) | AP 64225 Cabinet Design 133 (Mod. 1) | | |
| (vi) | 5895-AP 164337 Coder, Transponder | | S.I.F. Outfit SNB |

NOTE: 1 Two items of Type 944M equipment, viz., Decoder, Passive and Decoder, Distress, are fitted in the Type 954M(1) transponder cabinets.

(b) TYPE 954M(2)

As in (a) above with the addition of Radar Test Set AN/UPM-6B (MSA) and with AP 64223 Cabinet Design 131 (Mod. 1) instead of 5895-AP 164237 Cabinet.

NOTE: 2 The two items of Type 944M equipment referred to in Note 1 are not fitted in the Type 954M(2) cabinets.

PHYSICAL DATA

	Height	Width	Depth	Weight
Cabinets with equipment	6 ft	22 in	28 in	600 lb approximately

POWER REQUIREMENTS

	954M(1)	954M(2)
115 V, 50/60 Hz main supply	750 VA	600 VA
115 or 220 V anti-condensation heater supply	210 W	120 W

REMARKS

The main items of transponder equipment are of American design, although manufactured in the United Kingdom under the Mutual Security Aid (M.S.A.) agreement. The cabinets and S.I.F. coder are of British design and manufacture.

HANDBOOK

BR 2329

ESTABLISHMENT LISTS

Type 954M(1) and (2)	E1128
Outfit AMA	E1171
Outfit FFC	E1172
Outfit SNB	E1307
Test Set AN/UPM-6B (MSA)	AE25

INSTALLATION SPECIFICATION

B832

RADAR TYPE 955

955

SUMMARY OF DATA

PURPOSE

I.F.F. Mark 10 transponder for small craft and submarines.

BRIEF DESCRIPTION

Type 955 is the I.F.F. Mark 10 transponder fitted in small craft and submarines. The main unit is the Air Ministry Transmitter-Receiver TR 6061, this being controlled by Admiralty Pattern 71395 Control Unit Design 142 Transponder.

The interrogations are received as pulse pairs on a frequency of 1030 MHz. These are converted to video signals in the receiver, which generates a single pulse for each appropriate interrogation. This pulse is fed to the modulator which in turn excites the transmitter, the output of which is fed to the aerial and radiated on 1090 MHz as a reply to the interrogation.

FREQUENCY

1030 MHz Reception.
1090 MHz Transmission.

POWER OUTPUT

500 watts peak.

PULSE REPETITION FREQUENCY

Up to 2500 pulses per second (depending on interrogation).
interrogation).

PULSE LENGTH

0.5 microsecond.

RECEIVER BANDWIDTH

10-12 MHz at 6 dB below maximum.

MAJOR UNITS

TR 6061 Transmitter-Receiver
AP 71395 Control Unit Design 142 Transponder.

PHYSICAL DATA

	Height	Width	Depth	Depth
TR 6061	9½ in	9½ in	14 in	30 lb
Control Unit	6½ in	4 in	4½ in	1 lb

ASSOCIATED AERIAL OUTFIT

AMA in surface craft
AMJ in submarines

POWER REQUIREMENTS

115 V, 320-2600 Hz single phase a.c. 350 watts
24 V d.c. 150 watts. (This allows for additional equipment to be added later.)



TR 6061

RESTRICTED

HEAT DISSIPATION

110 watts. (without additional equipment.)

HANDBOOK

BR 2188 (AP 2887N Volume 1)

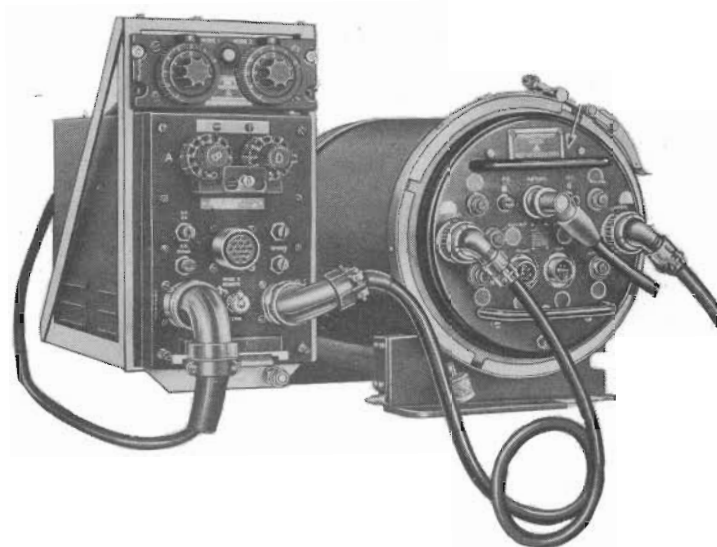
ESTABLISHMENT LIST

E 1214

INSTALLATION SPECIFICATION

B858

RESTRICTED

RESTRICTEDBR 333(1)
Original**RADAR TYPE 955M****955M****SUMMARY OF DATA****PURPOSE**

I.F.F. Mark 10 transponder with Selective identification Feature (S.I.F.) for small craft and submarines.

BRIEF DESCRIPTION

The main units are of Ministry of Aviation design, with Admiralty pattern control unit, rack and connectors which enable the equipment to be used in ships. Type 955 is converted to Type 955M by the addition of S.I.F. Outfit SNC.

The interrogations are received as pulse pairs on a frequency of 1030 MHz. These are converted to single pulses in the receiver section of the transponder and fed to the coding unit, which generates a pulse train for each pulse fed in. The pulse trains, the composition of which is set by controls on the front of the coding unit and control unit 6465, are fed to the modulator of the transmitter section of the transponder. The transmitter output is fed to the aerial and radiated on 1090 MHz as replies to the interrogations.

The equipment may be converted to basic I.F.F. operation by inserting a 'Navy' function plug in the transmitter-receiver in place of the 'S.I.F.' function plug which is used for S.I.F. operation. In this condition the S.I.F. coding circuits are bypassed and the aerial will radiate one pulse for each pulse pair received.

FREQUENCY

1030 MHz reception. 1090 MHz transmission.

POWER OUTFIT

500 watts peak

PULSE REPETITION FREQUENCY

Up to 2500 pulses per second (depending on interrogation).

PULSE DURATION

0.5 microsecond (the transponder normally transmits a train of pulses).

RECEIVER BANDWIDTH

10-12 MHz at 6 dB below maximum.

RESTRICTED

RESTRICTED

MAJOR UNITS

Transmitter-Receiver TR 6061.
AP 71395 Control Unit Design 142 Transponder.
Coding Unit 6466, with Control Unit 6465 (Part of S.I.F. Outfit SNC).

ASSOCIATED AERIAL OUTFIT

AMA in surface craft, AMJ or AMK in submarines.

PHYSICAL DATA

	Height	Width	Depth	Weight
TR 6061	9 $\frac{1}{2}$ in	9 $\frac{1}{2}$ in	14 in	30 lb
Control Unit AP 71395	6 $\frac{1}{2}$ in	4 in	4 $\frac{1}{2}$ in	1 lb
Coding Unit 6466 and Control Unit 6465 in rack }	12 $\frac{1}{2}$ in	6 $\frac{1}{2}$ in	10 $\frac{3}{16}$ in	14 lb

POWER REQUIREMENTS

115 V, 400 Hz single phase a.c. 140 watts. 24 V d.c. 53 watts.

HEAT DISSIPATION

190 watts

HANDBOOKS

Type 955/M	BR 2188 (AP 2887N Volumes 1 and 6).
Aerial Outfit AMA	NAVSHIPS 91597 (MSA) Instruction Book for Antenna Assembly AS-177/UPX(MSA)
Aerial Outfit AMJ	Summary of Data for Confidential Radio Equipment.
Aerial Outfit AMK	CB

ESTABLISHMENT LISTS

Type 955/M	E1214
S.I.F. Outfit SNC	E1322
Aerial Outfit AMA	E1171

INSTALLATION SPECIFICATION

B858

RESTRICTED

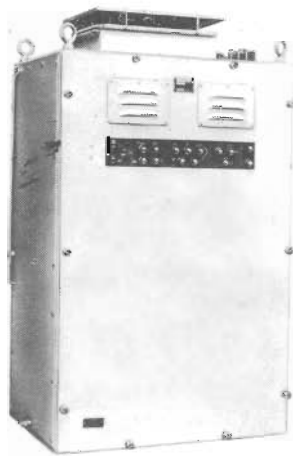
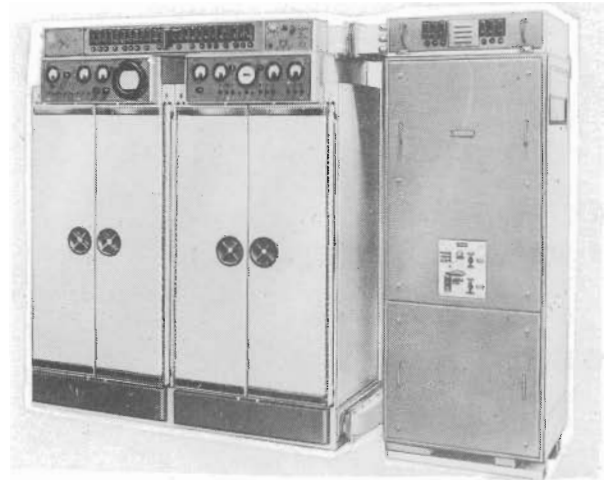
TYPE 957

957

SUMMARY OF DATA



MONITOR R.F.

AERIAL CONTROL
CABINET

ELECTRONIC CABINETS

AIR CONDITIONER

PURPOSE

A short range, approximately 200 miles tactical and general navigation system for aircraft providing, in the aircraft, continuous range and bearing information of the beacon.

BRIEF DESCRIPTION

The system provides continuous meter indication in the aircraft of the bearing of the transmitting beacon, to any number of aircraft, together with aural identification of the particular beacon being received.

Range is obtained in the aircraft by a distance measuring system in which a Tacan transmitter sends a correctly coded pulse, the time delay of the response being used to indicate the distance in miles from the beacon. The beacon can provide this information for up to 100 aircraft.

TYPE OF TRANSMISSION

Pulse coding, Pulse duration $3.5 \pm 0.5 \mu s$.

Peak Power 5 kW, Pulse pairs spaced $12 \mu s \pm 0.5 \mu s$.

FREQUENCY RANGE

Transmit 962 to 1024 MHz (Low Band)
1151 to 1213 MHz (High Band)

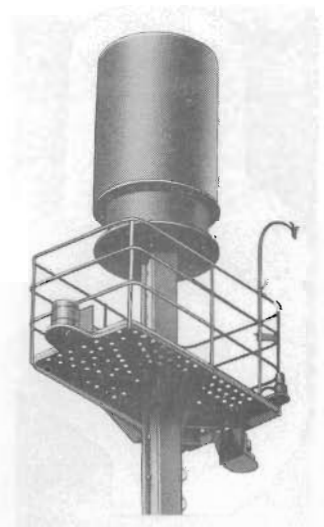
Receive 1025 to 1110 MHz.

There are 126 channels available.

AERIAL SYSTEM

Aerial Outfit AMG.

This consists of a central array which produces the required vertical radiation pattern, and two rotating cylinders (900 r.p.m.) carrying the parasitic elements which give 15 Hz and 135 Hz sine wave modulation, used in connection with bearing information.



AERIAL OUTFIT AMG

RESTRICTED

MAJOR UNITS

<u>NSN</u>	<u>Description</u>	<u>Height</u>	<u>Diameter</u>	<u>Weight</u>
5825-99-932-5351	Aerial Assembly (High Band)	69½ in	43½ in	425 lb
5825-99-932-5318	Aerial Assembly (Low Band)	77½ in	43½ in	425 lb

		<u>Height</u>	<u>Width</u>	<u>Depth</u>	<u>Weight</u>
5825-99-932-5319	Aerial Control Cabinet	70 in	24½ in	18 in	500 lb
5825-99-932-5358)	Electronic Cabinets	77 in	66 in	29 in	2900 lb
5825-99-932-5359)					
AP 63150	Air Conditioner	65 in	24 in	24 in	200 lb
6625-99-943-3584	Monitor R.F.	36 in	24 in	16 in	300 lb

POWER REQUIREMENTS

400/416/440 V 3 phase 45/65 Hz

8 kVA approximately, including aerial motor supplies.

HANDBOOKS

AP 2534L BR 2135

ESTABLISHMENT LIST

E 1225

INSTALLATION SPECIFICATION

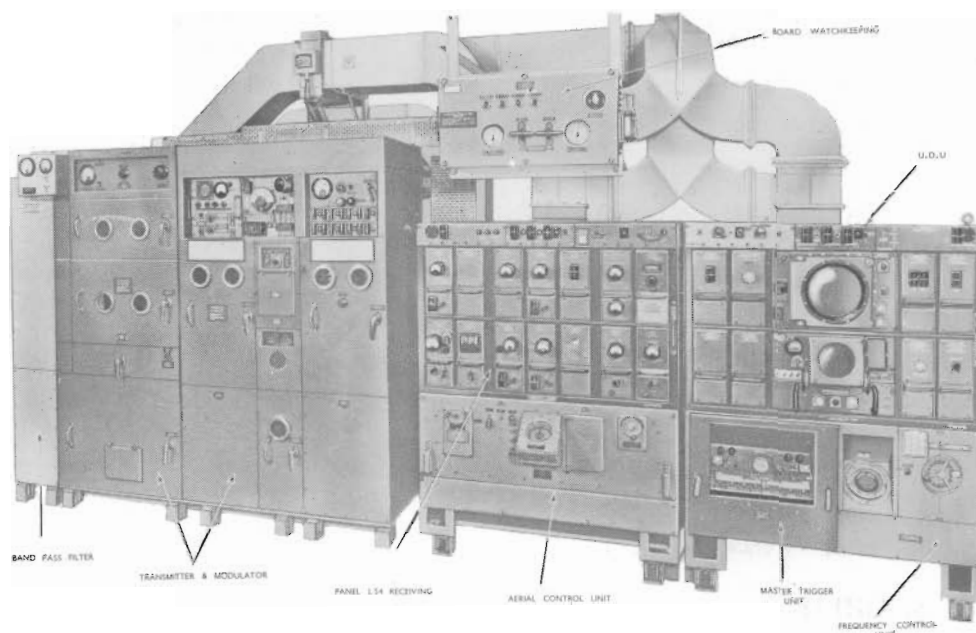
B883

RESTRICTED

TYPE 960

960

SUMMARY OF DATA



PURPOSE

TYPE 960 GENERAL VIEW OF OFFICE EQUIPMENT

Aircraft warning radar

BRIEF DESCRIPTION

Type 960 is a long range warning radar which is normally fitted in association with certain other radar sets such as Types 277P/Q, 293P/Q, 872, 983, 992 and I.F.F. to form an integrated warning system. In most cases all the sets in a combination are powered from a common supply system, and transmissions are synchronised by pulses from a master trigger unit. Anti-jamming circuits are incorporated, and remote control of switching for these circuits is provided, usually in the R.D.R. All operational information from Type 960 and associated sets is available from displays in the operations Room and R.D.R. A display panel is also fitted in the 960 office for setting-up purposes.

FREQUENCY

Spot frequencies within the band 80 to 90 MHz.

POWER OUTPUT

450 kW approximately

PULSE REPETITION FREQUENCY

250 pulses per second.

PULSE DURATION

5 or 15 microseconds.

INTERMEDIATE FREQUENCY

8 MHz

RECEIVER BANDWIDTH

- (a) 65 kHz for long pulse (15 μ s)
- (b) 500 kHz for short pulse (5 μ s)

RESTRICTED

MAJOR UNITS

(a) Transmitter and Modulator (panel 3 BT)

- | | |
|-------------------------------------|---|
| 1. AP 58771A Panel 3 BT Oscillating | 4. AP 58774 Panel 3 BT Supply Filtering |
| 2. AP 58772A Panel 3 BT Amplifying | 5. AP 58775A Panel 3 BT Modulating Left |
| 3. AP 58773A Panel 3 BT Output | 6. AP 58776 Panel 3 BT Modulating Right |

(b) Panel L54 Receiving AP 58781A

- | | |
|---|---|
| RU1 AP 58782 Amplifier Unit I.F. Des. 8 (Narrow Band) | RU10 AP 58791 Rectifier Unit Des. 102 |
| RU2 AP 58783 Amplifier Unit I.F. Des. 9 (Wide Band) | RU11 AP 58792 Rectifier Unit Des. 103 |
| RU3 AP 58784 Filter Unit Video Des. 16 | RU12 AP 58793 Amplifier Unit Power Video |
| RU4 AP 58785 Rectifier Unit Des. 100 | RU13 AP 58794 Cathode Follower Unit Des. 13 |
| RU5 AP 58786 Rectifier Unit Des. 101 | RU14 AP 58792 Rectifier Unit Des. 103 |
| RU6 AP 58787A Range Calibrator Des. 3 | RU15 AP 58786 Switch Unit Des. 31 |
| RU7 AP 58788 Performance Meter Des. 6 | RU16 AP 58797 Switch Unit Des. 32 |
| RU8 AP 58789 Amplifier Unit R.F. Des. 8 | RU17 AP 58798 Switch Unit Des. 33 |
| RU9 AP 58790 Auto Frequency Control Unit | RU18 - Main Frame |

(c) Miscellaneous

- | | |
|---|---|
| 1. AP 63697C Filter Unit Des. 64 | 6. AP 58680 Board 2AR Distributing Des. 1 |
| 2. AP 62861A Meter Unit Des. 21 | or |
| 5340-AP 172339 Automatic Protection Unit | AP 68669 Board Distributing Des. 8 |
| 3. AP 58670 Control Unit Des. 45 (Local Frequency) | 7. AP 58780 Switch Unit Local/Remote |
| 4. AP 58779 Trigger Unit Des. 4 (Master Trigger Unit) | 8. AP 65644 Rack, Stowage Des. 13 |
| 5. AP 65785A Board, Watchkeeping, Des. 2 (d.c. ships) | (for spares) |
| or | |
| AP 61530 Board, Watchkeeping, Des. 3 (a.c. ships) | |

ASSOCIATED AERIAL OUTFIT

AQQ(2) or AQQ(3)

ASSOCIATED DISPLAY OUTFITS

JL/JM series

ASSOCIATED I.F.F. SETS

Type 944M(1) Interrogator, Type 954M(1) or Type 954M(2) Transponder

PHYSICAL DATA

Weight of office equipment (including local display panel, aerial control unit and power distribution board - 3 tons approximately. Dimensions of typical office 14 ft 6 in long, 11 ft wide, 7 ft high.

POWER SUPPLIES

(a) D.C. Ships

- 220 V d.c. 10.25 kW 24 V d.c. 200 W
230 V 50 Hz 3 phase 2.25 kVA 50 V 50 Hz single phase 200 VA
120-360 V 250 Hz single phase 9 kVA
180 V 500 Hz single phase 3.5 kVA

(b) A.C. Ships

- 440 V 60 Hz 3 phase 10.75 kVA
220 V d.c. 200 W 24 V d.c. 200 W
230 V 60 Hz 3 phase 2.45 kVA
60 V 60 Hz single phase 200 VA
120-360 V and 180 V as for D.C. Ships

HEAT DISSIPATION IN OFFICE

7 kW approximately

HANDBOOK

BR 1181(1) and (2)

ESTABLISHMENT LIST

E 850

INSTALLATION SPECIFICATION

B640

RESTRICTED

RESTRICTEDBR 333(1)
Original**TYPE 963 TRANSMITTER AND RECEIVER****963****SUMMARY OF DATA****PURPOSE**

The transmitter and receiver, with aerial outfit AKN and associated equipments, form part of the Carrier Controlled Approach system. This is a 3 cm radar system used for aircraft carrier landing operations.

FREQUENCY

9350 to 9800 MHz

POWER OUTPUT

200 kw peak (nominal)

PULSE REPETITION FREQUENCY

Free running : 200 p/s
(+ 0% - 20%)
Externally-triggered : 400 - 2000 p/s

V.S.W.R.

Not less than 0.67 over the frequency band.

PULSE LENGTH

0.5 microsecond +0% -20%

BEAM WIDTH

Horizontal (to half power) $1^{\circ} \pm 0.2$
Vertical (to half power) $1.65^{\circ} - 1.85^{\circ}$
Elevation angle of beam axis 3.5° but adjustable by
Dockyard between 2° and 4° .

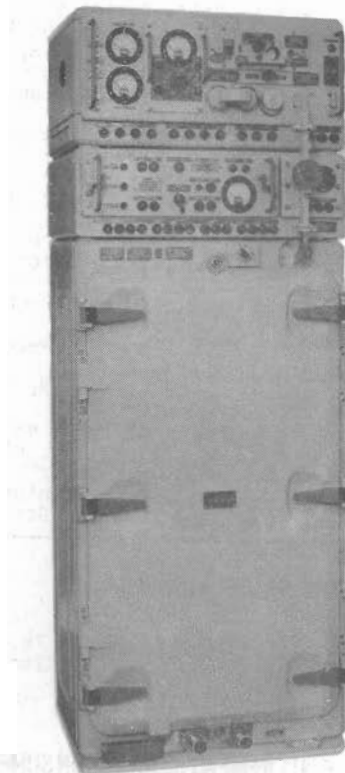
RECEIVER SENSITIVITY9 μ watts peak pulse r.f. input to receiver gives 1 volt peak pulse video output into 70 ohms.**RECEIVER NOISE FACTOR**

16 dB

RECEIVER BANDWIDTH"The 3 dB bandwidth" is 5 MHz \pm 1 MHz**INTERMEDIATE FREQUENCY**30 MHz \pm 1 MHz**MAJOR UNITS**

The following table lists the major units in or associated with the transmitter and receiver assemblies:-

UNIT	AP No.
1. CABINET ASSEMBLY, DESIGN 78, TRANSMITTER consisting of: Cabinet, Design 103, transmitter Sub Modulator Chassis Control Unit, Design 99, Transmitter Rectifier Chassis, 63CP, Alarm	62300 62301 62304 62307 62676
2. The following are associated with AP 62300, and are first-fitting items: Transmitter Chassis, 69C Rectifier Chassis, 63CA, Transmitter	 62305 62306



TRANSMITTER AND RECEIVER

RESTRICTED

RESTRICTED

UNIT	AP NO.
3. CABINET ASSEMBLY, DESIGN 79, RECEIVER consisting of:	62310
Cabinet, Design 102, Receiver	62311
Receiver Drawer, 62L	62312
Waveguide Milled Block, Size 16	62704
Head-Amplifier Unit	62318
Amplifier Unit, I.F., 45 W	62319
Amplifier Unit, Video, 47J	62700
A.F.C. Unit, Design 9	62701
Wavemonitor Chassis, Design 2	62703
Rectifier Chassis, 63CB, Receiver	62313
4. ANCILLARY EQUIPMENT, consisting of:	
Switch, Waveguide, Design 3, Changeover	62666
Dummy Load, Design 20	62674
Switch, Sync and Video, Changeover	62667
Switch Unit, Design 88, Blind Sector	62668
Phase Changer	62675
Resistance Panel, Alarm	64348
Wavemonitor Unit, Design 4	64641
5. RECEIVER TEST CABINET consisting of:	
Cabinet, Design 102, Receiver	62311
Receiver Drawer, 62L	62312
Receiver Chassis, 63CB, Receiver	62313
Head Amplifier Unit	62318
Amplifier Unit, I.F., 45 W	62319
Amplifier Unit, Video, 47J	62700
A.F.C. Unit, Design 9	62701
Base, Mounting, Aluminium	62702
Wavemonitor Chassis, Design 2	62703

WEIGHT OF MAJOR ASSEMBLIES

CABINET ASSEMBLY, DESIGN 78, TRANSMITTER, AP 62300, plus Transmitter Chassis, 69C, AP 62305, and Rectifier Chassis, 63CA, Transmitter, AP 62306	540 1b
CABINET ASSEMBLY, DESIGN 79, RECEIVER	120 1b

POWER REQUIREMENTS AND CONSUMPTION

REQUIREMENTS

200 V, 400/500 Hz	: filaments, h.t. and e.h.t. transformers, and blowers if 200 V blowers are incorporated.
500 V d.c.	: control unit for transmitter switching relays and warning lights
220 V d.c.	: anti-condensation heaters in d.c. ships
or	
440 V, 60 Hz, single-phase	: anti-condensation heaters in a.c. ships

CONSUMPTION

200 V, 400/500 Hz	: transmitter, 1250 VA
	receiver, 300 VA
220 V d.c.	: transmitter, 100 W
or	receiver, 30 W
440 V, 60 Hz, single-phase	

AERIAL SYSTEM

Aerial Outfit AKN

HANDBOOK

BR 1557

ESTABLISHMENT LIST

E 1138

INSTALLATION SPECIFICATION

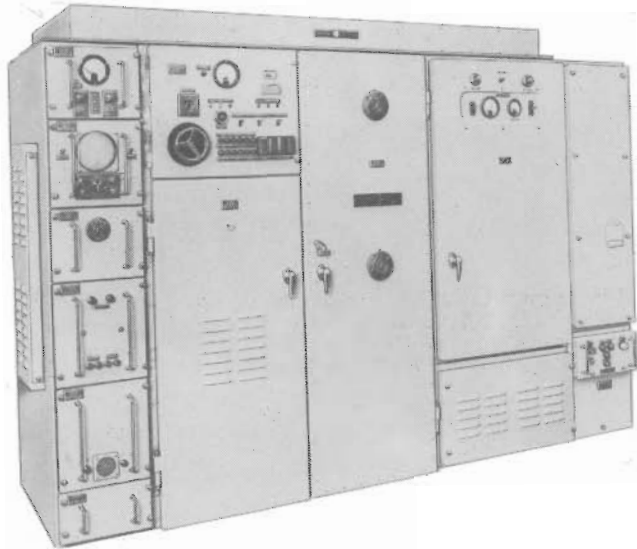
B 840

RESTRICTED

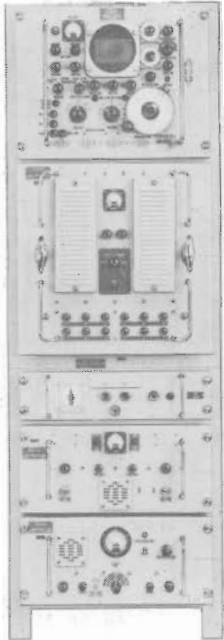
TYPE 965M/P

965M/P

SUMMARY OF DATA



TRANSMITTER - GENERAL



CABINETS (UPPER) POWER AND MONITOR
(LOWER) RECEIVER AND VIDEO

PURPOSE

Small Ships Aircraft Warning.

BRIEF DESCRIPTION

Type 965M/P is a long range aircraft warning radar designed primarily to be fitted in destroyers and frigates. A common aerial is used for the transmitter and receiver. These two items together with the office display unit (Monitor Unit Design 44) are situated below decks. Up to six remote P.P.I. displays may be fed with the present arrangement of cathode followers. Type 965M/P is also integrated with I.F.F. Mk. 10.

FREQUENCY

216-224 MHz

WAVELENGTH

1.4 metres (approx.).

POWER OUTPUT

450 kW

PULSE REPETITION FREQUENCY

200 or 400 p/s (nominally).

PULSE LENGTH

3.8 μ s and 10 μ s

AERIAL ROTATION SPEED

10 r.p.m.

INTERMEDIATE FREQUENCY

13.5 MHz

AERIAL BEAM WIDTH

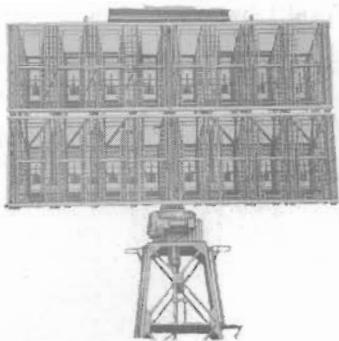
Horizontal - 12°
Vertical - 40°(approx.)

RECEIVER BANDWIDTH

Long Pulse 120 kHz
Short Pulse 330 kHz

ASSOCIATED AERIAL OUTFIT

Aerial Outfit AKE(1) for 965M.
Aerial Outfit AKE(2) for 965P.



AERIAL OUTFIT AKE(2)

RESTRICTED

MAJOR UNITS

AP 172020	Cabinet Design 221
AP 173026	Cabinet Modulator
AP 173027	Cabinet Oscillator
AP 173028	Door Assembly Oscillator
AP 201031	Filter Unit R.F.
AP 173117	Duplexer
AP 173115	Cabinet (Upper)
containing	
AP 172036A	Monitor Unit Design 45 R.F.
AP 173100	Power Supplies Stabilised
AP 173116	Cabinet (Lower)
containing	
AP 172033	Receiver Radar
AP 173037	Amplifier Video

PHYSICAL DATA

Cabinets Design 221, Modulator and Oscillator, with Weight (loaded) - 3300 lb.
Blower Assembly, Filter R.F. and Duplexer. Dimensions - 79½ in high, 106½ in wide, 31 in deep.
Cabinets (Upper) and (Lower) Weight (loaded) - 600 lb
Dimensions - 72 in high 22½ in wide, 25 in deep.

POWER REQUIREMENTS

230 V 50/60 Hz 3 phase 3 wire 6 kVA or
400 V 50/60 Hz 3 phase 4 wire.
220 V d.c. 1-2 kW or 115 V a.c. (anti-condensation heaters).

HANDBOOKS

BR 2317(1)(2A)(2B) Type 965M/P
BR 1186 Aerial Outfit AKE(1)
BR 2342 Aerial Outfit AKE(2)

ESTABLISHMENT LISTS

E 1295 (965M/P), E 1230 Aerial Outfit AKE(1) and AKE(2).

INSTALLATION SPECIFICATION

B847 {965M/P}
B889 {AKE(1)}
B912 {AKE(2)}

RESTRICTED

RESTRICTEDBR 333(1)
Original**TYPE 965Q/R****965Q/R****SUMMARY OF DATA****PURPOSE**

Air-warning, Moving-Target-Indicating (MTI) Radar for Frigates. In the MTI Mode Clutter Is Suppressed.

FREQUENCY216 - 224 MHz
($\lambda = 1.4$ metres approx)**POWER OUTPUT**

450 kW peak.

P.R.F.

To reduce the effect of interference from other radars, one of five available pulse intervals is selected:-

2580 μ s, 2590 μ s, 2600 μ s, 2610 μ s, 2620 μ s ($\pm 3 \mu$ s). In the non MTI mode the P.R.F. is set by Pulse Synchronising Outfit RSE.**PULSE DURATION**4 μ s (nominal) for MTI working.
10 μ s for non-MTI working.**STAGGER**

The pulse spacing is varied using P.T.M. For each Pulse Interval there is a Corresponding Stagger Time:-

	μ s	μ s	μ s	μ s	μ s	
Pulse Interval	2580	2590	2600	2610	2620	($\pm 3 \mu$ s)
Stagger	± 516	± 518	± 520	± 522	± 524	($\pm 2 \mu$ s)

AERIAL AND RECEIVER OUTFITS

	Ae Outfit	Rx Outfit
Type 965Q(1)	AKE(1)(3) Single Stack	CEQ(1) for auto detection
Type 965Q(2)	AKE(1)(3)	
Type 965R(1)	AKE(2)(4) Double Stack	CEQ(1) for auto detection
Type 965R(2)	AKE(2)(4)	

AERIAL BEAMWIDTH

- a. Horizontal 12°
b. Vertical 40° (approx.)

AERIAL ROTATION SPEED

10 rev/min.

I.F. BANDWIDTH

- a. Short pulse (MTI) 360 kHz at -3 dB points
b. Long pulse 120 kHz at -3 dB points.

INTERMEDIATE FREQUENCY

13.5 MHz

POWER SUPPLYS

- a. Transmitter
230 V, 50/60 Hz, 3 ϕ , 3-wire, 6 kVA
or 400 V, 3 ϕ , 4-wire.
220 V d.c. or 115 V a.c., 800 W for anti-condensation heater.
b. Receiver/Signal Processor (Rx/S.P.)
230 V or 115 V, 50/60 Hz, 400 W
115 V, 50/60 Hz, 150 W, for anti-condensation heater.

MAJOR UNITS

- 5840-99-521-1373 Receiver/Signal Processor (Rx/S.P.)
- Types 965M/P and Q/R have identical Transmitter Cabinet Assemblies.

RESTRICTED

RESTRICTED

PHYSICAL DATA

	Height	Width	Depth	Weight
Tx	79 in 200.7 cm	106 1/2 in 269.9 cm	29 in 73.7 cm	3300 lb 1496.8 kg
Rx S.P.	66 in 167.6 cm	24 in 61 cm	27 in 68.6 cm	600 lb 272.15kg

BRIEF DESCRIPTION

Type 965Q/R improves upon Type 965M/P by providing the choice of the MTI mode of operation when its use is advantageous. To achieve the MTI mode, the Receiver has a Coherent Oscillator (COHO) to provide the coherence in phase between transmission and reception. The COHO is phase locked to the transmitter pulse. Additionally, a highly stable local (STALO) r.f. oscillator is used to produce the i.f.. A P.R.F. Discrimination (PRFD) Control gives a choice of 5 pulse intervals to reduce the effect of interference pulses from other radars.

HANDBOOKS

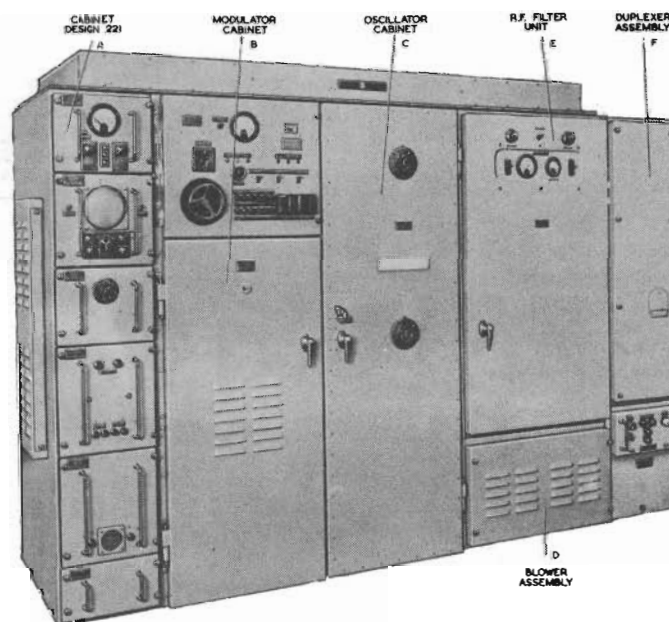
BR 2477 series for Type 965Q/R
 BR 1186 Aerial Outfit AKE1
 BR 2342 Aerial Outfit AKE2
 BR 2367 Bearing Transmission Outfit TRA Series
 BR 2436 Radar Data Distribution Outfit PFA
 BR 2318 Interference Suppression Outfit RIS
 BR 2429 High Accuracy Receiver Outfit CEQ
 BR 2355 }
 BR 2330 } Radar Type 944 I.F.F.
 BR 1379 }

ESTABLISHMENT LIST

E1295 Type 965 (all Variants)

INSTALLATION SPECIFICATION

B847



TRANSMITTER - GENERAL VIEW

TYPE 974(1)(2)

974

SUMMARY OF DATA

PURPOSE

A high definition warning surface radar set used principally for pilotage and navigation. Type 974(1) has a 12 in Display. Type 974(2) a 5 in Display.

BRIEF DESCRIPTION

Type 974 is a radar set which gives high definition of surface targets up to a maximum range of 25 miles. It is capable of ranging down to 20 yards with a range discrimination of 25 yards on shorter ranges. The range accuracy is of the order of 2% of the indicated range. Control of the equipment is effective from the main display unit. Only one remote display unit (Display Outfit JU) can at present be fitted.

The Operations Room contains the Receiver Unit, Main Display Unit and Azimuth Stabiliser Unit. The R.F. head which comprises the Modulator, Transmitter and R.F. section of the Receiver is housed in the Aerial Outfit AKL.

FREQUENCY

9345 - 9405 MHz

WAVELENGTH

3.2 cm

POWER OUTPUT

7 kW (peak)

PULSE REPETITION FREQUENCY

1000 p/s.

PULSE LENGTH

0.14 μ s on 1 and 3 mile ranges.
0.26 μ s on 10 and 25 mile ranges.

RECEIVER BANDWIDTH

10 MHz flat to within 3 dBs.

BEAM WIDTH

Vertical 23° Horizontal 1.6°

AERIAL ROTATION SPEED

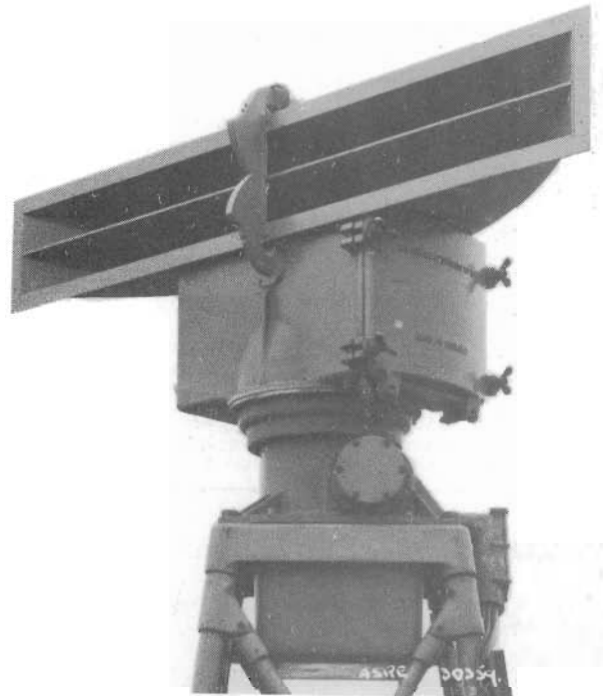
24 revs per minute.

POWER REQUIREMENTS AND CONSUMPTION

A.C. Ships	440 volts 60 Hz 4 phase 1 kW 1.9 amp per phase (running) 5 amp per phase (starting)	D.C. Ships	110 or 220 volts d.c. 1 kW.
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HEAT DISSIPATION

Receiver Unit	240 watts	Power Supply Unit	370 watts
Display Unit	105 watts	R.F. Head	50 watts
Power Pack for Remote Display	100 watts	Motor Scanner Drive	260 watts



AERIAL OUTFIT AKL

RESTRICTED

MAJOR UNITS AND PHYSICAL DATA

AP No.	Description	No. off			Physical Data			
		A.C. Ships	110 V D.C. Ships	220 V D.C. Ships	Height	Width	Depth	Weight
100002	R.F. Head	1	1	1	Fitted in Aerial			
100005	Receiver-Unit D.C.	—	1	1	2' 10"	1' 7"	10"	85 lb
100006A	Display Unit 12 in D.C.	—	1	1	1' 6½"	1' 4½"	2' 1½"	165 lb
100007	Power Supply Unit 440 V 3 ph A.C.	1	—	—	1' 7"	2' 8"	1' 7"	284 lb
100008	Power Supply Unit 220 V D.C.	—	—	1	1' 7"	2' 8"	1' 5"	217 lb
100009	Azimuth Stabilisation Unit	1	1	1	7½"	1' 3"	6"	20 lb
100014	Receiver-Unit A.C.	1	—	—	2' 10"	1' 7"	10½"	85 lb
100015A	Display Unit 12 in A.C.	1	—	—	1' 6½"	1' 4½"	2' 1½"	165 lb
100026	Power Supply Unit 110 V D.C.	—	1	—				
100012	Power Pack for Remote Display	1	1	1	1' 10"	1' 0"	11½"	50 lb
100309	Control Unit							
Aerial Outfit AKL								
100000	Reflector Unit	1	1	1	3' 2"	4' 2"	16½"	63 lb
100001	Pedestal Unit D.C.	—	1	1				78 lb
100013	Pedestal Unit A.C.	1	—	—				78 lb
100003	Motor Scanner Drive 440 V A.C. 50 Hz	1	—	—				33 lb
100004	Motor Scanner Drive 220 V D.C.	—	—	1				33 lb
100268	Motor Scanner Drive 110 V D.C.	—	1	—				33 lb

ASSOCIATED AERIAL OUTFIT

Aerial Outfit AKL consisting of Reflector Unit, Pedestal Unit and Motor Scanner Drive. It houses the R.F. head.

ASSOCIATED POWER SUPPLY OUTFIT

The necessary power supplies (80 V 1000 Hz A.C.) are derived from power supply units included as part of Type 974 and has not been allowed a separate designation.

REMARKS

Type 974 is the Commercial Decca Marine Radar Type 12, modified for service use.

HANDBOOK

BR 1983

ESTABLISHMENT LIST

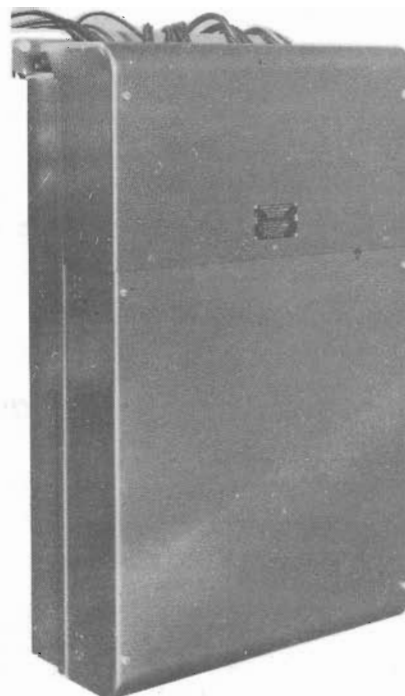
E 1031

INSTALLATION SPECIFICATION

B 728



MAIN DISPLAY UNIT



RECEIVER UNIT

TYPE 975(1),(2)

975

SUMMARY OF DATA

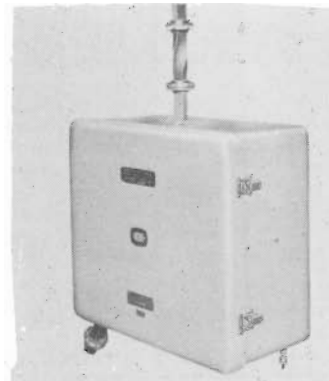
PURPOSE

A close range high definition surface warning radar used principally for pilotage and navigation. High land masses etc. can be detected out to 48 miles. Fitted in small ships such as Frigates, C.M.S., I.M.S., R.F.A.

BRIEF DESCRIPTION

The Transmitter-Receiver is contained in a case of mild steel which is designed for bulkhead mounting. The case contains the Modulator, the Magnetron, the Local Oscillator, the R/F Head, a Monitor Cavity and the Head Amplifier.

The Display Outfit which may be table or pedestal mounted, contains a 12 in c.r.t. with preset electrostatic focusing. All operating controls are mounted on the front panel of the display. The Main I.F. Signal Amplifier is also contained in the display.



TRANSMITTER-RECEIVER RADAR

FREQUENCY AND WAVELENGTH

9320 MHz - 9500 MHz (3 cm approx).

POWER OUTPUT

50 kW (Peak)

PULSE REPETITION FREQUENCY

1100 p/s.

PULSE DURATION

0.17 or 0.32 μ s (controlled by Range Switch)

INTERMEDIATE FREQUENCY

60 MHz

RECEIVER BANDWIDTH

12 MHz

RANGE DISCRIMINATION

Better than 35 yards on short pulse,
better than 70 yards on long pulse.

MINIMUM RANGE

Better than 35 yards

BEARING ACCURACY

Better than 1 degree

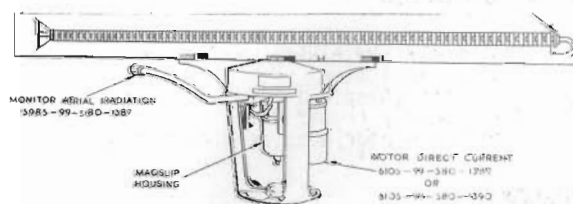
BEARING DISCRIMINATION

Aerial 6 ft Outfit AZF - 1.2 degrees

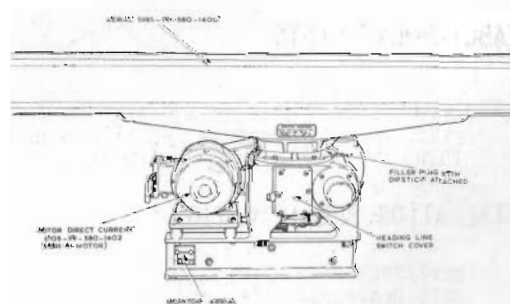
Aerial 10 ft Outfit AZG(1) - 0.7 degrees.



DISPLAY OUTFIT JUC1/2



AERIAL 6 FT OUTFIT AZF



AERIAL 10 FT OUTFIT AZG(1)

RESTRICTED

MAJOR UNITS

NATO Stock No.	Description	Physical Data			
		Height	Width	Depth	Weight
5840-99-580-1392	Transmitter Receiver Radar	1 ft 4 in	1 ft 6 in	9 in	93 lbs
5840-99-580-1380	Indicator Azimuth Range (JUC1)	1 ft 10 in	1 ft 5 in	2 ft 3 in	110 lbs
or					
5840-99-580-1397	Indicator Azimuth Range (JUC2)	1 ft 10 in	1 ft 5 in	2 ft 3 in	110 lbs
5840-99-580-1381	Control Indicator	1 ft 5 in	1 ft 2 in	7½ in	45 lbs
5840-99-580-1384	Power Supply	1 ft 2 in	1 ft 0 in	5 in	21 lbs
6125-99-580-1395	Motor Generator (d.c.)				208 lbs
or					
6125-99-580-1396	Motor Generator (a.c.)				290 lbs
	AERIAL OUTFITS				
5985-99-580-1388	Aerial 6 ft Outfit AZF				113 lbs
5985-99-580-1400	Aerial 10 ft Outfit AZG(1)				} 300 lbs
	and				
5985-99-580-1401	Pedestal Aerial				

ASSOCIATED AERIAL OUTFITS

Aerial 6 ft Outfit AZF. A six foot end-fed slotted waveguide radiator. Used with Type 975(1).

Aerial 10 ft Outfit AZG(1). A ten foot end-fed slotted waveguide radiator, together with a Pedestal turning mechanism. Used with Type 975(2).

ASSOCIATED DISPLAY OUTFITS

Display Outfit JUC(1). A 12 in watertight Display with range strobe indication in nautical miles and cables.

Display Outfit JUC(2). A 12 in non-watertight Display with range strobe indication in yards.

A maximum of two Display Outfits JUC(1) or JUC(2) or a combination of these two outfits may be used.

POWER REQUIREMENTS AND CONSUMPTION

440 V Hz 3 phase 2 kW approx.
220 V d.c. 2 kW approx.

HEAT DISSIPATION

Transmitter-Receiver 200 W
Control Indicator 25 W
Indicator (Display) 170 W
Power Supply (Power Unit) 70 W
Motor Generator a.c. or d.c. 1500 W

HANDBOOK

BR 2351 (Type 975)

ESTABLISHMENT LISTS

E1349 Type 975
E1350 Aerial Outfits AZF/AZG
E1351 Display Outfits JUC(1) and JUC(2)
E1203 Waveguide Outfit Size 16

INSTALLATION SPECIFICATION

B919/PRE3
B825 (Waveguide Size 16)

RESTRICTED

RADAR TYPE 978/M

978/M

SUMMARY OF DATA

PURPOSE

A close range, high definition surface warning radar used principally for pilotage and navigation. Large land masses etc. can be detected up to 40 miles.

FREQUENCY

9410 \pm 50 MHz.

POWER OUTPUT

25 kW (peak) minimum.

PULSE REPETITION FREQUENCY

1000 and 2000 p/s (switchable).

PULSE LENGTH

1 μ s at 100 p/s
0.2 μ s at 2000 p/s.

AERIAL ROTATION SPEED

20 rev/min for 50 Hz supply
24 rev/min for 60 Hz supply.

BEAM WIDTH

Horizontal 1.2° (to 3 dB one way)
Vertical 21° (to 3 dB one way)

RECEIVER BANDWIDTH

6 MHz minimum at -3 dB.

INTERMEDIATE FREQUENCY

60 MHz.

POWER REQUIREMENTS AND CONSUMPTION

115 V 60 HZ }
or 230 V 50 HZ } 2 kW

115 V 400 Hz 345 W for magslips

300-125 V } Any frequency
or 200-250 V } a.c. or d.c.

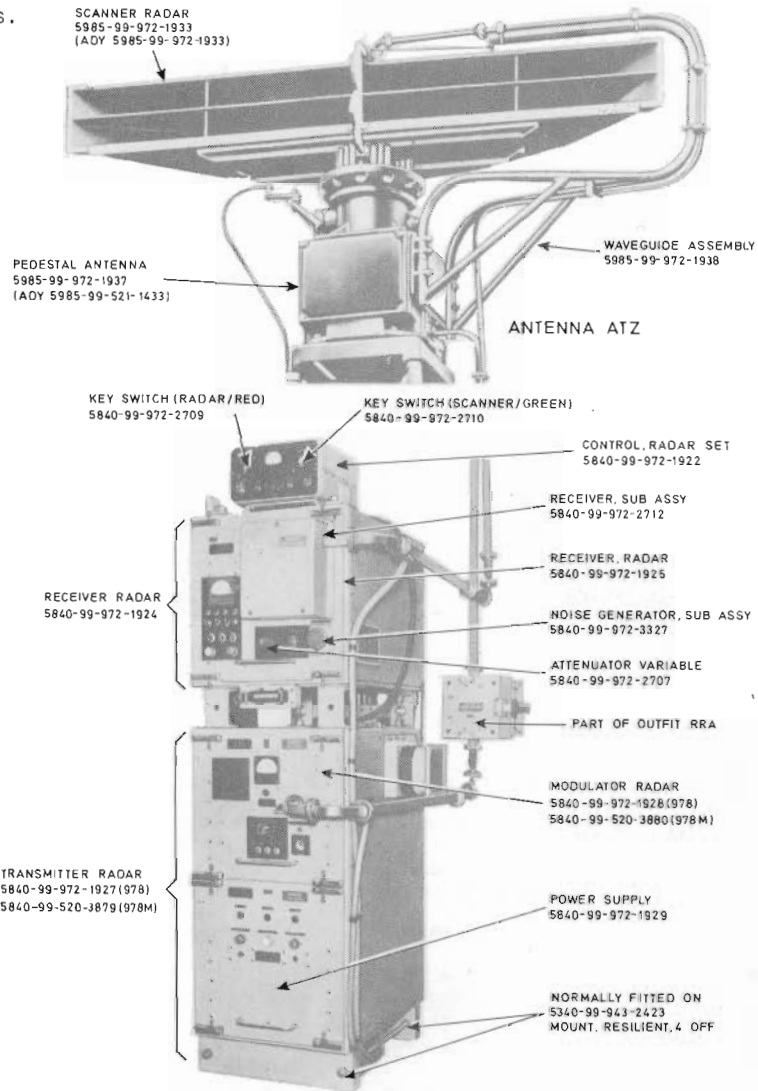
600 W For anti-condensation heaters.

The above supplies include power for one Display Outfit JUA.

ASSOCIATED ANTENNA

Antenna ATZ. This consists of a 6 ft double cheese, the upper for transmission, the lower for reception. Connection to the office equipment is made by Waveguide Outfit, Size 16, No. 3.

Antenna ADY. Similar to ATZ except that the scanner has alignment sighting device and pedestal is modified for coarse/fine bearing synchro transmission in lieu of two coarse bearing magslips.



RADAR TYPE 978 AND ANTENNA ATZ

RESTRICTED

MAJOR UNITS

Pattern No.	Description	Qty.	Physical Data			
			Height	Width	Depth	Weight
W8221	Air Conditioning Unit	1*				
5840-99-972-1927	Transmitter, Radar	1	3 ft	1 ft 5 in	1 ft 10 in	250 lb
or 5840-99-520-3879	when C.R.S.T. is fitted (978M)					
5840-99-972-1924	Receiver, Radar	1	2 ft	1 ft 5 in	1 ft 10 in	140 lb
5840-99-972-1922	Control, Radar Set	2	5½ in	1 ft	9½ in	5½ lb
	Antenna					
5985-99-972-1933	Scanner, Radar (ATZ)	1 }	3 ft 6 in	Turning Circle 6 ft 3 in		220 lb
5985-99-521-2682	Scanner, Radar (ADY)					
5985-99-972-1937	Pedestal, Antenna (ATZ)					
5985-99-521-1433	Pedestal, Antenna (ADY)					
*AP W8221 is only required for ships in which a supply of dry air cannot be made available from the H.P. air mains.						

ASSOCIATED DISPLAY OUTFIT

Display Outfit JUA (see separate Summary of Data). Normally 2 or 3 Display Outfits JUA(1),(2),(3) or (4) are fitted but Type 978 can be used with any P.P.I. and can feed up to 15 displays.

BRIEF DESCRIPTION

The Type 978 radar transmitter and its power supplies are self contained, the necessary switch functions being made by relay control from the Control Unit. Selection of internal or external triggering is possible by means of a switch on the front panel. A thermistor bridge in the r.f. section enables continuous monitoring of power output under true load conditions.

The receiver and its power supplies are also self-contained and operated from the Control Unit. Logarithmic amplification is used to improve the performance in conditions of rain or sea clutter. Reference signal for the a.f.c. circuits is provided by a magnetron sample pulse fed directly from the transmitter. An X-band noise source is built into the receiver for accurate measurement of overall noise factor.

Maximum range is 40 miles; minimum range less than 50 yards with 0.2 μ s pulse. Range discrimination less than 50 yards on 1 mile range scale. Range accuracy 50 yards on 1 mile scale; beyond this, within half radius of centre, 2% of indicated range, and outside half radius, 1% of maximum range. Bearing accuracy $\pm 1^\circ$. Bearing transmission is by means of an auto-aligning 400 Hz magstrip system.

Type 978M. Transmitter and Frame Assy. Modified for use with Control Radar Sector Transmission.

HANDBOOKS

BR 1152 (Type 978/M)

(BR 1156 JUA Series).

ESTABLISHMENT LISTS

E 1153 (Type 978 and C.R.S.T.)

E 1203 (Waveguide Outfit, Size 16, No. 3)

R 1521 Aerial Outfits ATZ and ADY.

INSTALLATION SPECIFICATION

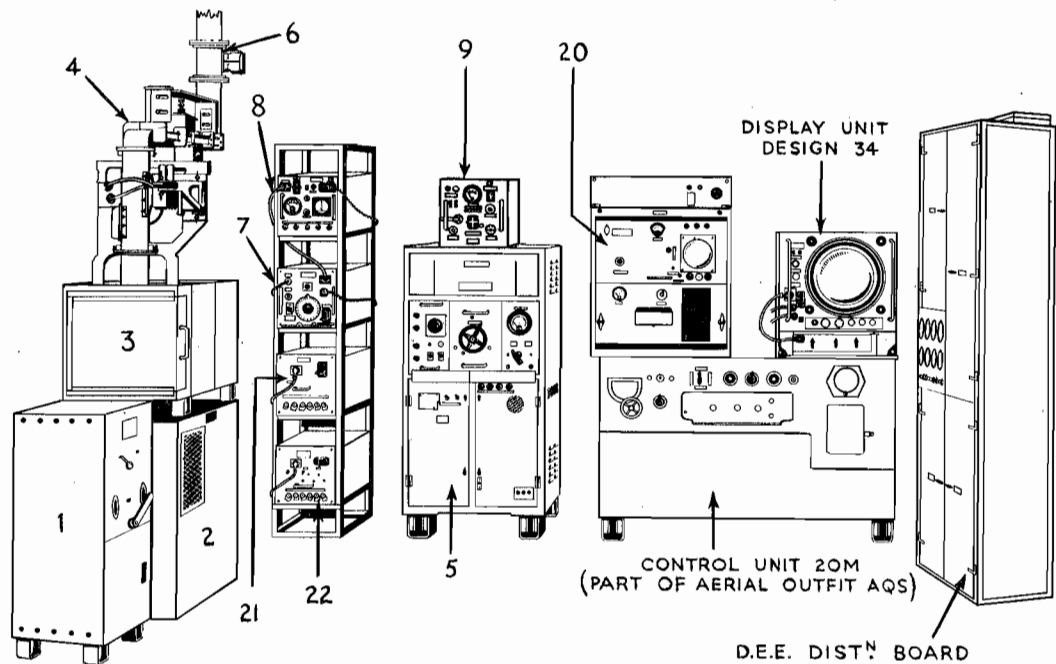
B 852/R.2.

RESTRICTED

TYPE 982

982

SUMMARY OF DATA



VIEW OF TYPE 982 OFFICE EQUIPMENT

PURPOSE

Type 982 with Aerial Outfit AQS is designed to give warning of air and surface targets.

BRIEF DESCRIPTION

Type 982 uses essentially the same panels as Types 277 P/Q and 293 P/Q but has a different aerial and aerial control system. The aerial rotates in synchronism with the Type 960 aerial, and has a high bearing accuracy so that the plan display of this set can be used for training Type 983 on the target for height finding.

The radar office, besides containing the modulator, transmitter and receiver panels, also contains an indicator outfit and aerial control unit (Control Unit 20M) which are normally used only for initial setting up and monitoring purposes, most operational control being effected from the Radar Display Room. However, in the event of damage or breakdown, the office can be used as an emergency operating position.

MAJOR UNITS

(a) Transmitter and Modulator

1. AP 53177 Air Conditioning Unit Des. 4
2. AP W7556 Soundproof Cabinet for Blower
3. AP W6177A Transmitter 9T
4. AP 58422A Output Unit Des. 3
5. AP 66501 Panel 3CC Rectifying and Modulating
6. AP 66584 Meter Unit, Field Strength (Waveguide)
7. AP 66765 Spectrometer Cavity Resonator Unit
8. AP 66766 Spectrometer Display Unit
9. AP 66848 Signal Generator (Noise)
10. AP W9199 Matching Unit Des. A
11. AP 58222 Frequency Changer Unit Des. 6
12. AP 58423A Switch Unit, Common Aerial
13. AP W5287/A Wavemonitor G86
14. AP 55941 Temperature Control Unit 133 °F (Mean)
15. AP 66502 Trigger Unit Des. 10
16. AP 53137 Attenuator Head Des. 1
17. AP 59310 Meter Unit Des. 7
18. AP 65539 Board Watchkeeping Des. 1
19. AP 66589 Neon Plate and Drive TB Des. 2

(b) Receiver Outfit CEL

20. AP 58363 Panel L53 (Receiving)
21. AP 53197 Cathode Follower Unit Des. 5
22. AP 53198 Cathode Follower Unit 6 way
23. AP 57496 Amplifier Unit I.F. Des. 5
24. AP 58234 Cathode Ray Unit Des. 36
25. AP 58395 Oscillator G225
26. AP 58396 Amplifier Unit I.F. Des. 7
27. AP 58397 Cathode Follower Unit Des. 12
28. AP 58399 Control Unit Des. 37
29. AP 58400 Meter Unit Des. 4
30. AP 26811A Rectifier Unit SE6

Items 10, 11 and 12 are components of Item 4
 Items 13, 14 and 15 are components of Item 5
 Items 23 to 30 inclusive are components of Item 20.

FREQUENCY

3000 MHz (10 Hz)

POWER OUTPUT

500 kW (peak)

PULSE REPETITION FREQUENCY

500 p/s

POWER REQUIREMENTS

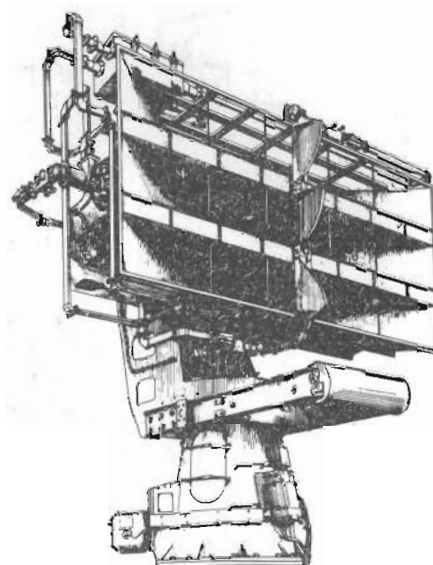
180 V 500 Hz	4 kW
230 V 50 Hz 3 PH	3.5 kW
120 V 333 Hz	1 kW
120 V 1100 Hz	2 kW
220 V d.c.	17.5 kW
24 V d.c.	1.5 kW

PULSE LENGTHS

0.7 or 1.9 microseconds

BEAM WIDTH

2.2° horizontal (half field strength)
19° vertical (half field strength)



AERIAL OUTFIT AQS

INTERMEDIATE FREQUENCY

13.5 MHz

RECEIVER BAND-WIDTHS

4 MHz, 1 MHz or 0.5 MHz.

Common power supplies to Aerial Outfit AQS-taken from Office Distribution Board.

ASSOCIATED POWER SUPPLY OUTFIT

A.C. Supply Outfit DVJ (See separate Summary of Data Sheet)

ASSOCIATED AERIAL OUTFIT

Aerial Outfit AQS (See separate Summary of Data Sheet)

PHYSICAL DATA

Weight of single office equipment - 34 cwt
Weight of double office equipment - 60 cwt
(Types 982/3 combined)
Dimensions of single office - 11 ft by 12 ft.
Dimensions of double office - 16 ft by 14 ft.

HANDBOOK

BR 2161(1)(2)

ESTABLISHMENT LIST

E 1007

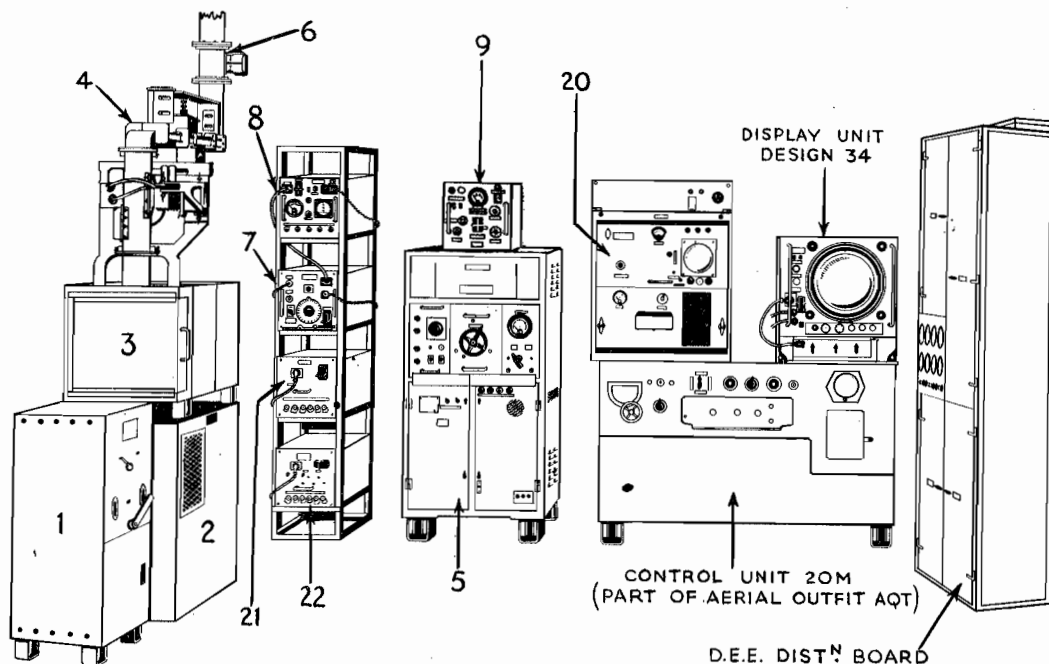
INSTALLATION SPECIFICATION

B 674

TYPE 983

983

SUMMARY OF DATA



VIEW OF TYPE 983 OFFICE EQUIPMENT

PURPOSE

Type 983 with Aerial Outfit AQT is used for accurate height-finding. When not required for height-finding it can be used to provide a warning of surface targets.

BRIEF DESCRIPTION

Type 983 uses essentially the same panels as Types 277 P/Q and 293 P/Q but has a different aerial and aerial control system. Type 983 is essentially an accurate height finding set. The aerial control system is similar to and closely interlinked with that of Type 982, the Type 983 aerial being trained on to the target by visual matching of a cursor with a plan display of Type 982 or 960. Height information is obtained from height finding Panel L48 (Display Outfit JS).

The radar office, besides containing the modulator, transmitter and receiver panels, also contains an indicator outfit and aerial control unit which are normally used only for initial setting up and monitoring purposes, most operational control being effected from the Radar Display Room. However, in the event of damage or breakdown, the office can be used as an emergency operating position, except for height finding.

MAJOR UNITS

(a) Transmitter and Modulator

1. AP 53177 Air Conditioning Unit Des. 4
2. AP W7556 Soundproof Cabinet for Blower
3. AP W6177A Transmitter 9T
4. AP 58422A Output Unit Des. 3
5. AP 66501 Panel 3CC Rectifying and Modulating
6. AP 66584 Meter Unit, Field Strength (Waveguide)
7. AP 66765 Spectrometer Cavity Resonator Unit
8. AP 66766 Spectrometer Display Unit
9. AP 66848 Signal Generator (Noise)
10. AP W9199 Matching Unit Des. A
11. AP 58222 Frequency Changer Unit Des. 6
12. AP 58423A Switch Unit, Common Aerial
13. AP W5287/A Wavemonitor G86
14. AP 55941 Temperature Control Unit 133 °F(Mean)
15. AP 66502 Trigger Unit Des. 10
16. AP 53137 Attenuator Head Des. 1
17. AP 59310 Meter Unit Des. 7
18. AP 65539 Board Watchkeeping Des. 1
19. AP 66589 Neon Plate and Drive T.B. Des. 2

(b) Receiver Outfit CEL

20. AP 58363 Panel L53 (Receiving)
21. AP 53197 Cathode Follower Unit Des. 5
22. AP 53198 Cathode Follower Unit 6 way
23. AP 57496 Amplifier Unit I.F. Des. 5
24. AP 58234 Cathode Ray Unit Des. 36
25. AP 58395 Oscillator G225
26. AP 58396 Amplifier Unit I.F. Des. 7
27. AP 58397 Cathode Follower Unit Des. 12
28. AP 58399 Control Unit Des. 37
29. AP 58400 Meter Unit Des. 4

NOTE Items 10, 11 and 12 are components of Item 4
Items 13, 14 and 15 are components of Item 5
Items 23 to 29 inclusive are components of Item 20

RESTRICTED

FREQUENCY

3000 MHz (10 Hz)

POWER OUTPUT

500 kW (peak)

PULSE REPETITION FREQUENCY

500 p/s

POWER REQUIREMENTS

180 V 500 Hz	- 4 kW
230 V 50 Hz 3 PH	- 3.5 kW
120 V 333 Hz	- 1 kW
120 V 1100 Hz	- 2 kW
220 V d.c.	- 17.5 kW
24 V d.c.	- 1.5 kW

PULSE LENGTHS

0.7 or 1.9 microseconds.

BEAM WIDTH

5° horizontal (half field strength)
2.1° vertical (half field strength)

INTERMEDIATE FREQUENCY

13.5 MHz

RECEIVER BAND-WIDTHS

4 MHz, 1 MHz or 0.5 MHz.

Common power supplies to Aerial Outfit AQT taken from Office Distribution Board.

ASSOCIATED POWER SUPPLY OUTFIT

A.C. Supply Outfit DVJ (See separate Summary of Data Sheet)

ASSOCIATED AERIAL OUTFIT

Aerial Outfit AQT (See separate Summary of Data Sheet)

PHYSICAL DATA

Weight of single office equipment - 34 cwt
Weight of double office equipment - 60 cwt
(Types 982/3 combined)
Dimensions of single office - 11 ft by 12 ft.
Dimensions of double office - 16 ft by 14 ft.

HANDBOOK

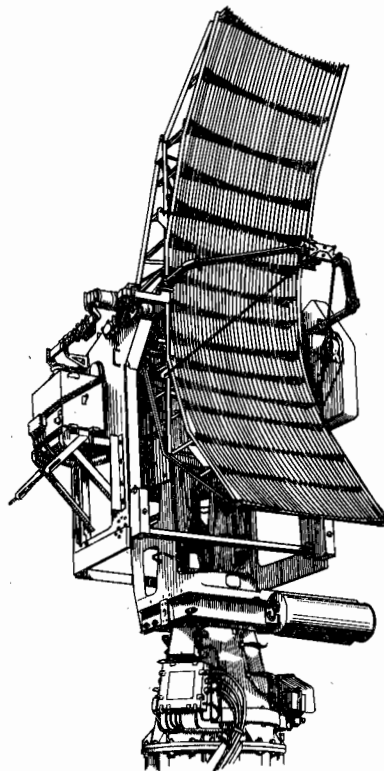
BR 2161(1)(2)

ESTABLISHMENT LIST

E 1007

INSTALLATION SPECIFICATION

B 674



AERIAL OUTFIT AQT

RESTRICTEDBR 333(1)
Original**RADAR TYPE 992Q****992Q****SUMMARY OF DATA****PURPOSE**

Target indication Set for use with ADAWS Mk. 1 for GWS 2 and as replacement for earlier Types 992.

BRIEF DESCRIPTION

Radar Type 992Q is a high-power, S-band medium range surveillance radar using modern, solid state techniques and a parametric amplifier. The frequency band is covered by three interchangeable, water-cooled magnetrons. The equipment is fully interlocked and can be remotely controlled.

FREQUENCY

2944 - 3052 MHz

in 3 bands:

CV 2168	3034 - 3052 MHz
CV 2169	2989 - 3007 MHz
CV 2170	2944 - 2962 MHz

P.R.F. 750, 500, 250 p/s
Normally from Pulse
Synchronising Outfit

MONITORING

The Cabinet Monitor, Transmitter provides comprehensive facilities including:

1. A Waveform Monitor for the eleven principal waveforms.
2. A general purpose oscilloscope and attenuating probe.
3. A direct reading Wavemeter for the Transmitter Frequency.

RECEIVER Separate, high accuracy receiver

RECEIVER BANDWIDTH 600 kHz logarithmic

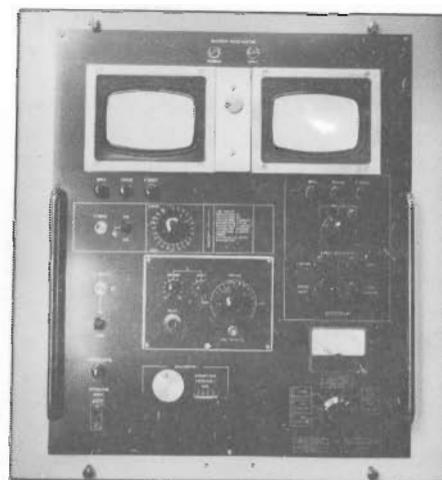
HEAD AMPLIFIER I.F. OUT 13.5 MHz

AERIAL Outfit ADN(1)

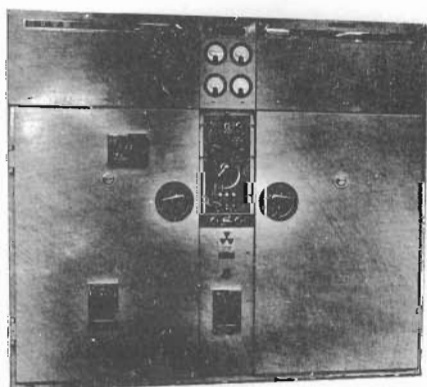
Beam width - horizontal $1\frac{1}{2}^{\circ}$
 - vertical 30°
Tilt - 15° above horizontal

PULSE DURATION 2 μ s Fixed

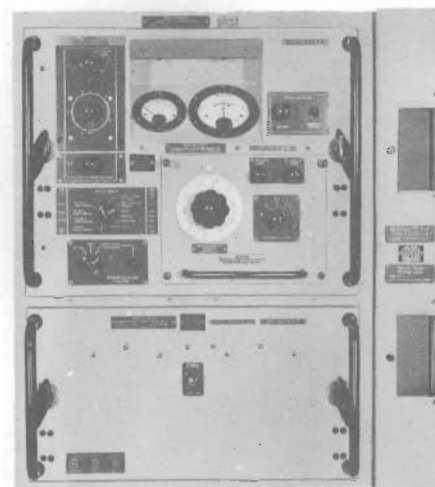
R.F. PEAK POWER OUTPUT 1.75 MW



CABINET
MONITOR-TRANSMITTER



TRANSMITTER, MODULATOR AND CONTROL CABINETS



CABINET
RECEIVER & MONITOR

RESTRICTED

RESTRICTED

MAJOR UNITS

The transmitter is assembled in three cabinets mounted horizontally on their sides, one above the other. These are, from bottom to top:-

A.P.173450 CABINET, MODULATOR (Cabinet 1) (Bottom)

containing:- Magnetron and its assembly.
A.P.173476 Modulator Sub-Assembly, Thyatron
A.P.173477 Modulator Sub-Assembly, Charging and Protection
A.P.173478 Modulator Sub-Assembly, Charging and Filter

A.P.173451 CABINET, TRANSMITTER (Cabinet 2) (Middle)

containing:- A.P.173461 Power Supply Low Voltage
A.P.173463 Waveguide Assembly (Including T-R switches)
A.P.173479 Transmitter Sub-Assembly, Contactor and Fusing
A.P.173480 Transmitter Sub-Assembly, Regulator H.T.
A.P.173481 Transmitter Sub-Assembly, Generator H.T.
A.P.173488 Power Supply 115 V.

A.P.173452 CABINET, CONTROL (Cabinet 3) (Top)

containing:- A.P.173458 Mixer and A.F.C.
A.P.173460 Control Modulator
A.P.173462 Generator Trigger
5840-99-520-7015 Parametric Amplifier (with 5840-99-521-2595 Control, Amplifier)

The Transmitter, Monitor and the High Accuracy Receiver are assembled in two Cabinets, one above the other. The Transmitter, Monitor is at the top.

5840-99-520-1774 CABINET MONITOR, TRANSMITTER

containing:-

5840-99-522-4031 MONITOR, PERFORMANCE

A.P.172855 CABINET RECEIVER AND MONITOR

containing:- 5840-A.P.172857 Drawer Receiver and Monitor
5840-A.P.172858 Drawer Power Supply

PHYSICAL DATA

	Height	Width	Depth	Weight
Modulator - Transmitter Assembly	67½ in	78½ in	28½ in	2400 lb
Cabinet Monitor Transmitter } Cabinet Receiver and Monitor }	55½ in	26½ in	25½ in	500 lb
				Rx. Mon. only

POWER REQUIREMENTS AND CONSUMPTION

Main Supply 440 V, 60 Hz, 3 ph., 9 kVA to Modulator - Transmitter Assembly

COOLING

AIR CHILLED WATER

992Q Transmitter - Modulator 600 ft³/min 40 gal/hour

HANDBOOKS

INSTALLATION SPECIFICATION

B.R.2499(1-5) series (3 volumes)
B.R.2524(1)(2)(3) series, (3 volumes) Aerial Outfit ADN } B1026
B.R.2429 High Accuracy Receiver Outfit CEQ }

ESTABLISHMENT LISTS

S1481, E1439 (Outfit ADN), E1174 (W.G. Outfit Size 10 No. 1), S1519 (Outfit CEQ)

RESTRICTED

RADAR TYPE 1010

1010

SUMMARY OF DATA

PURPOSE

Radar Type 1010 is an I.F.F. Mark 10 secondary radar that can interrogate on Modes 1, 2, 3/A or C, or a sequence of interlaced modes. The replies from transponders are detected to produce video outputs to external video processing equipment. Radar Type 1010 also provides synchronising and suppression pulses for external equipment, and has side lobe suppression facilities when used with a compatible S.L.S. aerial outfit.

MAJOR EQUIPMENT

The major equipment of Radar Type 1010 is the 5840-99-115-8746 Interrogator. The 5895-99-525-0154 Coder-Decoder is also included in the 'E' List for Radar Type 1010, but as it is only fitted in 'computer' ships it has a separate handbook.

PHYSICAL DATA

The dimensions of the 5840-99-115-8746 Interrogator are:

Height		Width		Depth		Weight	
inches	cm	inches	cm	inches	cm	lb	kg
48	122	24	61	24	61	434	198

POWER REQUIREMENTS

5840-99-115-8746 Interrogator requires two supplies of 115 V \pm 10% 45 to 65 Hz, single phase.

Equipment Mains 300 VA
Auxiliary Mains 70 VA

ENVIRONMENT TEMPERATURE RANGE

Operational 0 °C to 55 °C
Storage -10 °C to +70 °C

TRANSMISSION CHARACTERISTICS

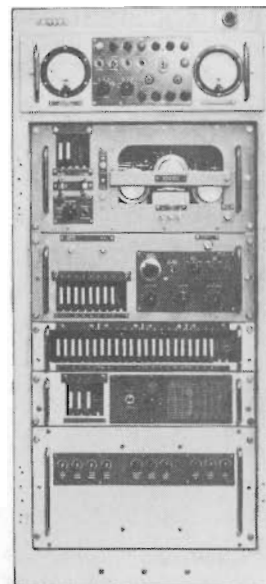
Frequency : 1030 MHz \pm 0.1 MHz
Peak Power Output : 33 dBW + 0.5 dB (can be reduced by 6 dB by rearranging links on fixed attenuator)
Pulse Durations : 0.6 μ s to 1.0 μ s
Pulse Rise Time : 0.05 μ s to 0.1 μ s
Pulse Fall Time : 0.05 μ s to 0.2 μ s
P.R.F. : 150 Hz to 450 Hz

RECEPTION CHARACTERISTICS

Frequency : 1090 MHz \pm 0.1 MHz
Bandwidth : 10 MHz at -3 dB
Noise : Not greater than 9.0 dB
Spurious Frequencies : Responses outside the passband are at least 80 dB below the 1090 MHz response.
I.F. : 60 MHz

EXTERNAL TRIGGER

Pulse Amplitude : not less than +5 V into 75 ohms
Pulse Duration : 0.5 μ s to 5 μ s
Pulse Rise Time : not greater than 0.1 μ s
P.R.F. : Minimum 150 Hz
Maximum 1 kHz, inputs exceeding 450 Hz are automatically reduced to be within the range 150 Hz to 450 Hz.



5840-99-115-8746
INTERROGATOR

RESTRICTED

RECEIVER INHIBIT INPUT

Pulse Amplitude : +5 V to +15 V into 75 ohms.
Pulse Duration : 0.5 μ s to 5 μ s.
Pulse Rise Time : not greater than 0.1 μ s.

VIDEO OUTPUTS

12 mode separated video outputs (three of each mode) and two mixed video outputs are provided. The mixed video includes identification pulse groups to facilitate recognition of mode replies.

Video Pulse Amplitudes +2 V to +5 V into 75 ohms.

SUPPRESSION, SYNCHRONISING AND SWITCHING PULSE OUTPUTS

Pulse Amplitudes +5 V into 75 ohms

Other pulse characteristics with timing relative to the last interrogation pulse P3.

(a) Transponder suppression

Pulse Duration 28 μ s adjustable

Pulse Timing P3-25 to P3 +3 μ s

(b) S.L.S. Switching

Pulse Duration 0.5 μ s

Pulse Duration leading edge coincident with P1 $\begin{matrix} +0 \\ -0.3 \end{matrix}$ μ s

(c) P1 Out

Pulse Duration 0.5 μ s

(d) P3 Out

Pulse Duration 0.5 μ s

(e) Decoder Sync.

Pulse duration 0.5 μ s to 1.0 μ s

Pulse Timing P3 -30 μ s

MAINTENANCE FACILITIES

- (a) Voltage and current metering
- (b) Transmitter power continuously indicated by meter.
- (c) Automatic fault detection circuits cause lamps to light if following parameters are faulty:-
 - Transmitter peak power 'Tx ALARM' lamp
 - Receiver gain)
 - Receiver noise) 'Rx ALARM' lamp

HANDBOOK

BR 4211

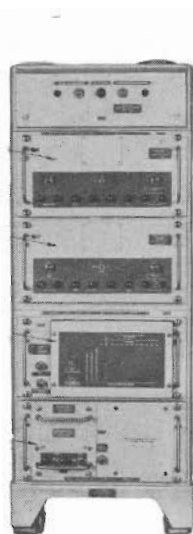
ESTABLISHMENT LIST

S1672

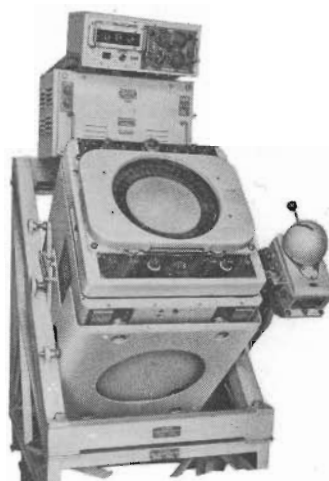
INSTALLATION SPECIFICATION

E1157

RESTRICTED

RESTRICTEDBR 333(1)
Original**S.I.F. OUTFIT SND****SND****SUMMARY OF DATA**

DECODER CABINET



DISPLAY OUTFIT JDA WITH ACTIVE DECODING

PURPOSE

S.I.F. (Selective Identification Feature) Outfit SND provides active decoding facilities for I.F.F. Mark 10 in ships fitted with interrogator Type 944M(1) or Type 944M(3). A maximum of two display positions in any one ship will be fitted for active decoding. S.I.F. Outfit SND(1) comprises the equipment for a single position and S.I.F. Outfit SND(2) the equipment for two positions.

BRIEF DESCRIPTION

With SND, any selected I.F.F. response can be passed to the active decoding system which, very briefly, will identify the code and display it on a visual numerical indicator at the display position. Selection of the response is achieved by means of a control joystick. This produces a marker which is controlled by the joystick to embrace the position of the selected response, whereupon a strobe waveform is generated every time the display trace passes through the response. This waveform is used to open an input gate in the active decoder, thereby allowing the response to be decoded and its code displayed. In practice, the active decoder makes an assessment of the code pulse received in up to eight successive pulse trains, so that the probable, or possible, code is displayed.

Concurrently with the fitting of SND, facilities are provided for Mode 1 S.I.F. codes to be selected at the active decoding displays.

POWER SUPPLIES

Power supply requirements are the same as for Type 944M(1), with the addition of a supply of 115 or 230 volts, 50/60 Hz, 200 W for the Gate Electronic (where fitted) and an occasional similar supply for AP 164708 Power Supply Assembly for test purposes.

RESTRICTED

RESTRICTED

MAJOR UNITS

Item	Reference No.	Description	Number	
			SND(1)	SND(2)
1	5895-AP 164701	Cabinet, Decoder (Active)	1	
2	5895-AP 174702	Cabinet, 2 Decoders (Active)		1
3	5895-AP 164210	Decoder, Active	1	2
4	5895-AP 164208	Drawer, Power Supply	1	1
5	5895-AP 164209	Power Supply	1	2
6	5895-AP 164657	Amplifier, Video	1	2
7*	5895-AP 164703	Control, Joystick, Range Bearing	1	2
8*	5895-AP 164704	Gate, Electronic	1	2
9	5895-AP 164706	Mixer Control Unit, All Modes (Active)	1	2
10	5895-AP 164207	Indicator, Code	1	2
11	5895-AP 164705	Amplifier, Video	1	1
12	5895-AP 164707	Test Set Decoder Assembly	1	1
13	5895-AP 164708	Power Supply Assembly (for use with Item 12)	1	1
14	6625-99-580-1640	Test Set, Electronic Circuits (Supplied to Repair Centres only)		

* Items 7 and 8 only supplied for JDA displays.

HANDBOOK

BR 2417

ESTABLISHMENT LIST

E 1389

INSTALLATION SPECIFICATION

B 831 Addendum F

RESTRICTED

RESTRICTEDBR 333(1)
Original**RECEIVER REPLY (TRANSPONDER) OUTFIT RRA****RRA****SUMMARY OF DATA****PURPOSE**

Receiver system fitted in conjunction with Radar Type 978 for processing replies from X-band transponders fitted in helicopters.

BRIEF DESCRIPTION

The radar transmissions from Type 978 impinge on the X-band transponder aerial in the helicopter, and for each pulse received the transponder transmits a reply on 9310 MHz. This reply consists of a series of 0.45 μ s pulses, the number of pulses in each train depending on pre-flight setting of a switch in the helicopter. In the ship the replies are extracted from the radar waveguide by a 3-port circulator and passed to the receiver system where they are converted to video for display. Two sets of video outputs are provided, one of which contains all the pulses of the transponder reply (coded) whilst the other supplies only the first pulse of each reply train (uncoded). At the display the transponder signals may be mixed with the radar video or displayed separately, selection being controlled by a Mixer, Electronic Marker (part of Marker Outfit MDA-MHD) or by Mixer, Video, Signal for displays not included in a Marker Outfit distribution.

FREQUENCY

9310 MHz

INTERMEDIATE FREQUENCY

30 MHz

BANDWIDTH

15 MHz

MAJOR UNITS

<u>NSN</u>	<u>Description</u>
5895-99-972-3303	Waveguide, Tee, Circulation
5895-99-972-3314	Receiver, Radio
5895-99-972-3305	Mixer, Video, Signal (fitted at display positions not having Mixer, Electronic Marker).
5895-99-972-3753	Delay Unit (fitted in radar video and sync lines to compensate for transponder delays).

PHYSICAL DATA

	<u>Height</u>	<u>Width</u>	<u>Depth</u>	<u>Weight</u>
Circulator	9 $\frac{5}{8}$ in	9 $\frac{1}{8}$ in	7 $\frac{1}{8}$ in	13 lb
Receiver	17 $\frac{5}{16}$ in	18 $\frac{1}{8}$ in	9 $\frac{1}{16}$ in	50 lb

POWER REQUIREMENTS

Main supply, 115 V, 50/60 Hz, 50 VA at 0.8 power factor.

Anti-condensation supply, 115/230 V a.c. or 220 V d.c., 30 W on 220/230 V supply, 7 $\frac{1}{2}$ W on 115 V supply.

HANDBOOK

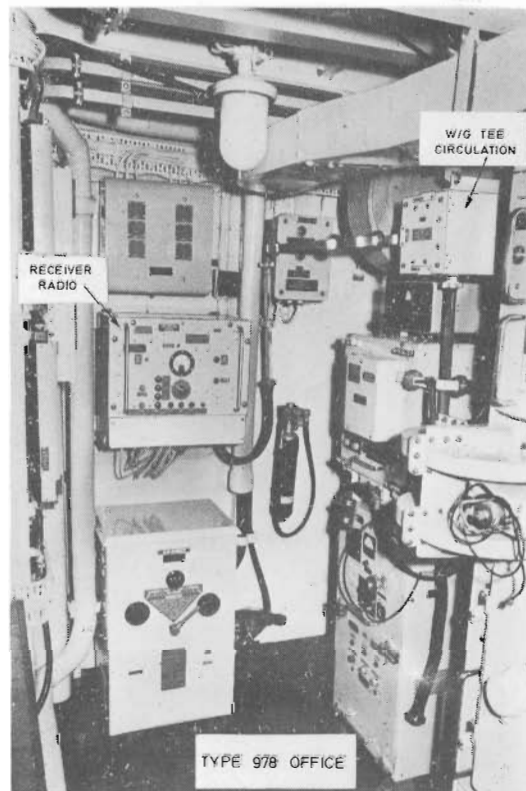
BR 2474

ESTABLISHMENT LIST

E 1467

INSULATION SPECIFICATION

B 927

**RESTRICTED**

RESTRICTEDBR 333(1)
Original

CABINET RECEIVER AND MONITOR
OUTFITS CEQ(1)(2)
(HIGH ACCURACY RECEIVER)
FOR RADAR TYPES 992P/Q, 965P, 278M

CEQ**SUMMARY OF DATA****PURPOSE**

A high accuracy radar receiver with high operational availability, compatible for use with radars of differing i.f. and providing ancillary facilities for Noise Factor measurements.

I.F.

13.5 MHz {CEQ(1)}
 30 MHz {CEQ(2)}

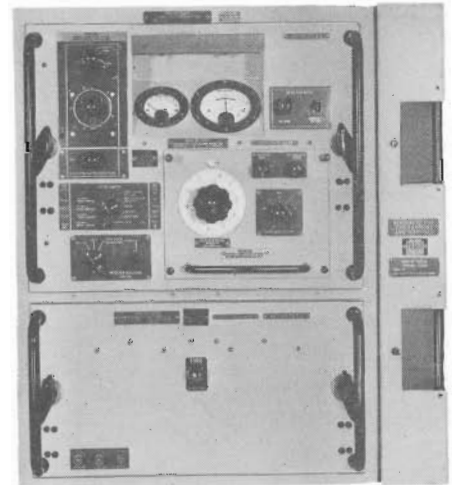
POWER SUPPLY

440 V, Single Phase, 60 Hz

MAJOR UNITS

AP 172855 Cabinet Receiver and Monitor, containing:

AP 172857 Drawer, Receiver and Monitor
 AP 172858 Drawer, Power Supply, Receiver

**DESCRIPTION**

The equipment is housed in one cabinet containing two swivelling drawers provided with interlocking switches for the safety of personnel. In the upper drawer, two identical logarithmic amplifiers are provided, one in use and the other at STANDBY-TEST. Fault finding and repair can proceed during system operation, so giving maximum operational availability. The valve stages amplify at low signal inputs, but detect at high signal inputs, the output being fed into a delay line which ensures that the outputs are in phase at the end of the line, irrespective of the degree of amplification. Two video outputs are provided via cathode follower stages. A Test Oscillator and metering components are provided in the drawer, so that a logarithmic amplifier can be checked rapidly. The logarithmic amplifiers, linear amplifier and test oscillator are available for either 13.5 MHz or 30 MHz; the correct units must be fitted to suit each installation. Conventional linear i.f. amplifiers are also provided for the measurement of Noise Factor in conjunction with a Test Oscillator and a variable attenuator. In the Power Supply Drawer, two separate power supplies provide +200 V, -150 V and -138 V from 440 V single phase 60 Hz.

HANDBOOK

BR 2429

INSTALLATION SPECIFICATION

B960 for 992P B847 for 965P B900 for 278M

ESTABLISHMENT LISTS

E1599 for CEQ(1)(2) E1438 for 992P E1295 for 965P E1280 for 278M

RESTRICTED

RADAR PULSE SYNCHRONISING OUTFIT RSD2

RSD2

SUMMARY OF DATA

PURPOSE

Outfit RSD2 is a Radar Synchronisation Unit that provides synchronised output pulses at various time-modulated, repetition frequencies.

CAPACITY

Synchronisation of eleven radars, one I.F.F. equipment and Rx blanking equipment.

P.R.Fs. OF ASSOCIATED EQUIPMENT

Multiples of 190 p/s up to 6080 p/s.

POWER REQUIREMENTS

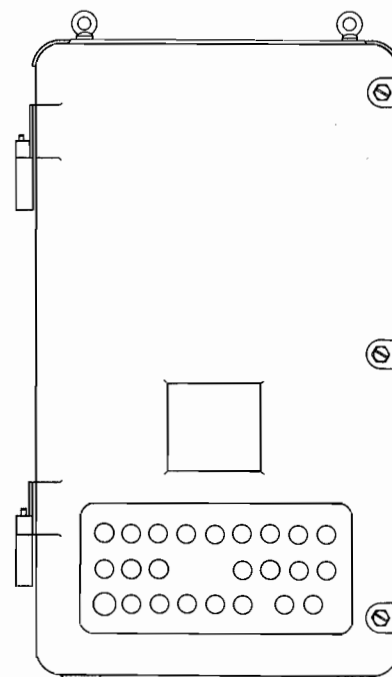
1. 115 V, 50/60 Hz, 0.8 A
2. 115 V, 50/60 Hz, 0.3 A (Anti-condensation heater)

BRIEF DESCRIPTION

The output radar trigger pulses are derived from a binary, count-down chain that is triggered by a master oscillator operating at 6080 p/s. This oscillator is frequency modulated with triangular waves and its output is time modulated with low frequency noise to provide a measure of anti-jamming.

MAJOR UNITS

1 off	5840-99-519-3700	Cabinet, Electrical Equipment
1 off	5840-99-917-4001	Generator, Reference Signal
1 off	5840-99-917-4002	Generator, Square Wave
1 off	5840-99-917-4003	Generator, Sweep
4 off	5840-99-917-4004	Frequency Divider
1 off	5840-99-917-4005	Discriminator, P.R.F.
10 off*	5840-99-917-4006	Delay, Electronic
15 off*	5840-99-917-4007	Amplifier Trigger Pulse
2 off*	5840-99-917-4008	Generator Pulse
1 off	5840-99-917-4009	Generator, Noise
1 off*	5840-99-917-4010	Converter, Waveform
1 off	5840-99-917-4011	Monitor, P.R.F.
1 off	5840-99-519-3701	Power Supply
2 off	5840-99-917-4013	Extension, Circuit Connector
1 off	5840-99-917-4014	Box, Stowage
1 off*	5840-99-917-4015	Frequency Divider
1 off	5995-99-918-1188	Cable Assembly Set, Electrical
1 off	5840-99-519-1623	Modulator Noise
9 off*	5840-99-924-1468	Dummy Panel, printed circuit



CABINET ELECTRICAL EQUIPMENT
5840-99-519-3700

* Maximum Nos off quoted here.
Refer to Part 3B Chapter 1
Table 1 for actual No. off
and location of units for
particular class of ship.

PHYSICAL DATA

	Weight	Width	Height	Depth
Cabinet Electrical Equipment	125 lb	18 in	33 in	9 in
Power Supply	13 lb	16½ in	5½ in	5 in
Box, Stowage	13 lb	17½ in	8½ in	21½ in
Cable Assembly Set, Electrical				
Remaining Units	4½ oz	1 in	4 in	5 in

HANDBOOK

BR 4119

ESTABLISHMENT LIST

E 1317

INSTALLATION SPECIFICATION

B 989

RADAR PULSE SYNCHRONISING OUTFIT RSE

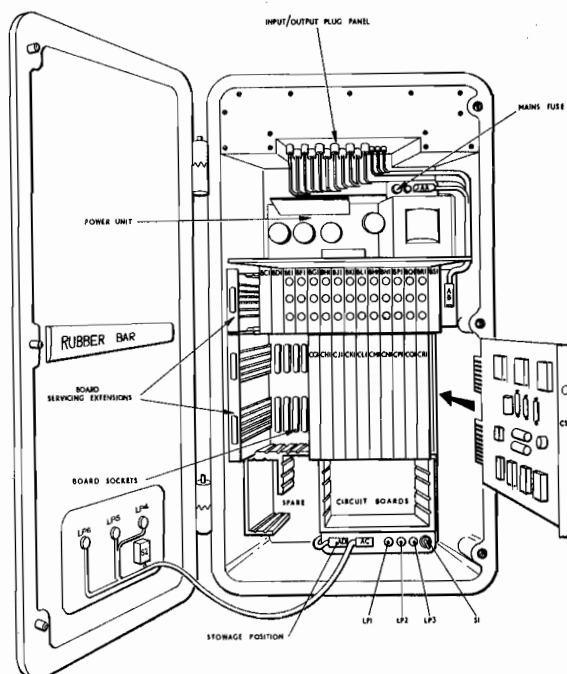
RSE

SUMMARY OF DATA

PURPOSE

To receive a staggered pulse from an MTI Radar (such as Type 965Q/R) with a triple stagger P.R.F. and provide two modes of synchronisation for other radars, I.F.F. equipment, and Rx blanking unit RIS6, namely:-

- Mode 1 - True synchronisation, in which each of the master input intervals is divided into a number of equal parts.
- Mode 2 - 'Third Pulse' synchronisation, in which the whole triple stagger interval is divided into a number of equal parts.



BRIEF DESCRIPTION

All radars are slaved to (but are non synchronous with) Type 965Q/R, except that if Type 901 is fitted the Type 978 is automatically slaved to Type 901; if Type 901 is not in use, Type 978 is slaved to Type 965Q/R. Mode 1 may be unusable if the maximum and minimum P.R.Fs. exceed the limitations of the MTI Radar. The equipment provides for the selection of preferred input from one of two MTI radars (if fitted) having the same PRF, automatically selecting internal generation of identical P.R.Fs, if all Synchronising inputs were to cease. UNIT NORMAL lamps normally glow at half brilliance; full brilliance (and the ALARM lamp) indicates a fault. Construction is Solid State using positive logic. Maintenance is by unit replacement.

POWER SUPPLY

115 V, 60 Hz, single-phase, 100 W

ANTI CONDENSATION HEATERS

115 V, 60 Hz, single-phase, 35 W from a source maintained under all Conditions including when the ship is in Dockyard or shipbuilder's hands.

HEAT DISSIPATION

150 W approximately.

PHYSICAL DATA

Height	Width	Depth	Weight
2 ft 10½ in 87.63 cm	19 11/16 in 50 cm	9 1/16 in 23.02 cm	150 lb 68.04 kg

RESTRICTED

MAJOR UNITS

	<u>5840-99-521-1308</u>	<u>Cabinet, Electrical Equipment</u>
(P.E.C.) 4 OFF	1309	Generator, Pulse Code
(P.E.C.) 12 OFF	1310	Amplifier, Trigger Pulse
(P.E.C.) 1 OFF	1311	Generator, Clock Pulse
(P.E.C.) 4 OFF	1312	Generator, Jitter
1 OFF	1313	Power Supply
(P.E.C.) 1 OFF	1314	Selector, Pulse Source
(P.E.C.) 1 OFF	1315	Converter, Waveform
(P.E.C.) 1 OFF	1316	Selector, P.R.F.
(P.E.C.) 1 OFF	1317	Alarm, Monitor
(P.E.C.) 1 OFF	2640	Selector Pulse
1 OFF	2641	Extension, Circuit Connector
1 OFF	2642	Extension, Circuit Connector

(P.E.C. = Panel Electronic Circuit)

ESTABLISHMENT LIST

S1520

HANDBOOK

BR 4118

INSTALLATION SPECIFICATION

B1060

RESTRICTED

RESTRICTEDBR 333(1)
OriginalSECTION 7CONTENTS LIST

Display Outfits JCA/B/C
Display Outfits JD(2), JE
Display Outfits JDA Series
Display Outfit JHA(1) (To be issued later)
Display Outfit JHB (To be issued later)
Display Outfits JL, JM
Display Outfits JL1P, JM1P

Display Outfit JP2
Display Outfit JP3
Display Outfit JP4/5
Display Outfit JQ
Display Outfit JS

Display Outfit JT1
Display Outfit JUA
Display Outfits JUA(3)-(7) and Outfit QAA
Display Outfit JUC3(with 975)
Display Outfits JUD(1)(2)(3) (with 1006) (To be issued later)

Display Outfit JU1
Display Outfit JU2
Display Outfit JW
Display Outfit JW2
Display Outfit JZ

Auto Surface Plotting System JYA(1)(2)(3)
Auto Surface Plotting System JYA(4)(5)(6)
Auto Surface Plotting System JYA(7)

Display Outfit JYB
Display Outfit JYC

(Radar Plot Information) Outfit RJT(1) and RJR(1)

True Motion Outfit QAA (see JUA3) (To be issued later)
True Motion Outfit QAB

Teacher Outfit HRL(1)
Teacher Outfit HRN
Teacher Outfit HRT (To be issued later)

Bearing Resolver Outfit PAB

Radar Data Distribution Outfits PFA Series

Electronic Marker Outfits MDA-MDH

RESTRICTED

RESTRICTEDBR 333(1)
Original**DISPLAY OUTFITS JCA, JCB AND JCC****SUMMARY OF DATA****JCA
JCB
JCC****PURPOSE****Display Outfits JCA Series**

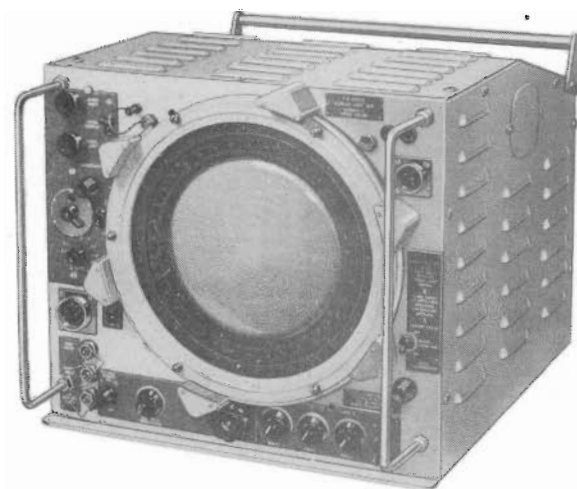
Provides height-finding facilities
(H.P.I. and E.P.I.)

Display Outfits JCB Series

Provides a plan picture from a continuously rotating
radar aerial (P.P.I.)

Display Outfits JCC Series

Provides facilities for lining-up a WCH radar aerial
with targets on a WA display (Azicator).



DISPLAY UNIT, 51R

BRIEF DESCRIPTION

Display Outfit JCA1 : Height Position Indicator (H.P.I.)
using Scale, AP 64255 in
conjunction with Types 277P/Q.

Display Outfit JCA2 : Elevation Position Indicator
(E.P.I.) with Scale, Blank, AP 64078,
in conjunction with Type 275 to
facilitate the detection of targets
in elevation.

Display Outfit JCB : Plan Position Indicator (P.P.I.) provides a "map-like" presentation of the
surrounding area which is "scanned" by the associated radar aerial.

Display Outfit JCC : Azimuth Indicator (Azicator) for lining-up the aerials of Types 277P/Q, and 983
with Type 960, and for transmitting Type 293P/Q bearing information from
Torpedo Control Position.

PERFORMANCE

The measured ranges are accurate to within $\pm 1\%$ with reference to the internal calibration markers
provided. In bearing, a variation of $\pm 0.5^\circ$ due to backlash in gearing must be allowed for in addition to the
fundamental limitations of the associated equipments.

MAJOR UNIT

The major unit of the Display Outfits is the Display Unit 51R, AP 63270. This Display Unit is modified
by Box of Parts, AP 57374 when used for azication purposes.

PHYSICAL DATA

Height	Width	Depth	Weight
1 ft 4½ in	1 ft 6½ in	2 ft 0 in	145 lb

POWER REQUIREMENTS AND CONSUMPTION

Power Supply 180 V, 500 Hz single phase, 200 W.
24 V, d.c. for auto-aligning.

HEAT DISSIPATION

200 watts

HANDBOOK

BR 2097

ESTABLISHMENT LIST

E 1126

INSTALLATION SPECIFICATION

B 810

RESTRICTED

RESTRICTEDBR 333(1)
Original**DISPLAY OUTFITS JD(2), JE****JD(2)
JE****SUMMARY OF DATA****PURPOSE**

Display Outfits JD Series

Provides height-finding facilities (H.P.I.).

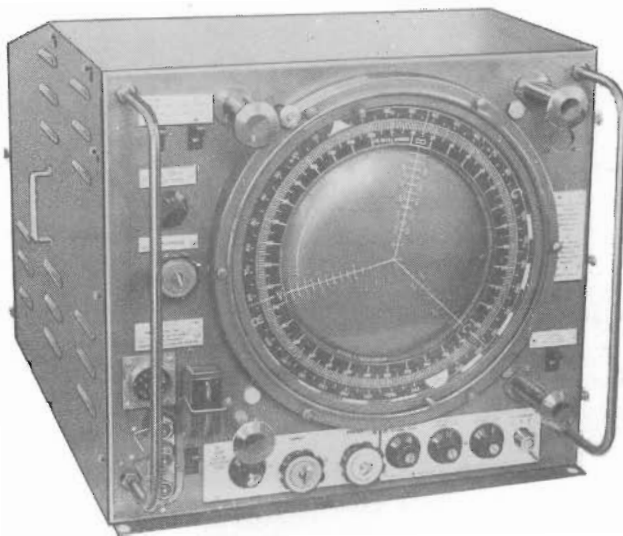
Display Outfits JE Series

Provides a plan picture from a continuously rotating Aerial (P.P.I.)

BRIEF DESCRIPTION

Display Outfit JD2 : Elevation Position Indicator (E.P.I.) used with Type 275 to facilitate the detection of targets in elevation.

Display Outfit JE : Plan Position Indicator (P.P.I.) provides a "map-like" view of the area "scanned" by the associated aerial.



PATT. 58370 DISPLAY UNIT DESIGN 17

PERFORMANCE

The measured ranges (short range) are accurate, being taken with reference to accurate calibration markers. In bearing, a variation of $\pm 0.5^\circ$ due to backlash in gearing, must be allowed for, in addition to the fundamental limitations of the associated equipment.

MAJOR UNIT

The major unit of these Display Outfits is the Display Unit, of which the basic design is Patt. 58370 Display Unit Design 17. This Display Unit is modified to suit the various applications and is then given separate pattern and design numbers.

PHYSICAL DATA

Height	Width	Depth	Weight
1 ft 4½ in	1 ft 6½ in	2 ft 0 in	110 lbs

POWER REQUIREMENTS AND CONSUMPTION

Power Supply : 180 volts 500 Hz

Consumption : 225 watts

HEAT DISSIPATION

225 watts

REMARKS

Appendix A and Appendix B to C.A.F.O. 198/50 also to BR 2010 tabulates the modifications incorporated in the various designs of display units and the development of the various designs from the original basic unit respectively.

HANDBOOKS

BR 2010

ESTABLISHMENT LIST

E 890

INSTALLATION SPECIFICATION

B 312

RESTRICTED

RESTRICTEDBR 333(1)
Original**DISPLAY OUTFITS JD(2), JE****JD(2)
JE****PURPOSE AND ASSOCIATED DISPLAY UNITS**

Outfit Name	Purpose	Major Unit
JD2	E.P.I. with Types 267W/MW: (Office): non-switchable:	Patt. 59881 Display Unit, Des. 25
JE11A	P.P.I. with Types 267W/MW: (Office): non-switchable: obsolescent.	Patt. 59880A Display Unit, Des. 24
JE11B	P.P.I. with Types 267W/MW: (Remote): non-switchable: obsolescent.	Patt. 59880A Display Unit, Des. 24
JE12A	P.P.I. with Types 271 or 273Q/QR: (Office): non-switchable: obsolescent.	Patt. 58370 Display Unit, Des. 17
JE11B	P.P.I. with Types 267W/MW: (Remote): non-switchable: obsolescent.	Patt. 59880A Display Unit, Des. 24
JE12A	P.P.I. with Types 271 or 273Q/QR: (Office): non-switchable: obsolescent.	Patt. 58370 Display Unit, Des. 17
JE12B	P.P.I. with Types 272P/PR: (Office): non-switchable: obsolescent.	Patt. 58370 Display Unit, Des. 17
JE12C	P.P.I. with Types 276 or 277/P/Q or 293/M/P/Q: (Office): non-switchable.	Patt. 58370 Display Unit, Des. 17
JE12CM	P.P.I. with Types 277P/Q or 293/P/Q or 982/983: (Office): non-switchable: Modified for use with Auto-aligning Mark 2.	Patt. 66684 Display Unit, Des. 34
JE12E	P.P.I. with Type 291M: (Office): non-switchable.	Patt. 58370 Display Unit, Des. 17
JE13	P.P.I. with Types 281/B/BP/BQ: (Office): non-switchable: obsolescent.	Patt. 58368 Display Unit, Des. 15
JE14A	Coupled pair of P.P.I.s. with Types 281BP/BQ: (Office): non-switchable: obsolescent.	Patt. 58367 Display Unit, Des.14 (inner) Patt. 58369 Display Unit, Des.16 (outer)
JE14C	Coupled pair of P.P.I.s. with Types 281BP/BQ or 960 (Remote): non-switchable	Patt. 58367 Display Unit, Des.14 (inner) Patt. 58369 Display Unit, Des.16 (outer)
JE14CM	Coupled pair of P.P.I.s. with Type 960: (Remote): non-switchable: Modified for use with Auto-aligning Mark 2	Patt. 66682 Display Unit, Des.32 (inner) Patt. 66683 Display Unit, Des.33 (outer)
JE14D	Coupled pair of P.P.I.s. with Types 960/982/983: (Remote): Inner P.P.I. switchable 960/983/983 or 960/983 Outer P.P.I. switchable 960/982/982 Modified for use with Auto-aligning Mark 2.	Patt. 66682 Display Unit, Des.32 (inner) Patt. 66683 Display Unit, Des.33 (outer)
JE14E	Coupled pair of P.P.I.s. with Types 960/277/277/293 series: (Remote): Inner P.P.I. switchable 960/277/277 or 960/293 Outer P.P.I. switchable 960/293 or 960/277/277	Patt. 58367 Display Unit, Des.14 (inner) Patt. 58369 Display Unit, Des.16 (outer)
JE14EM	Coupled pair of P.P.I.s. with Types 960 and 277P/Q and 293P/Q: (Remote): Inner P.P.I. switchable 960/277/277 or 960/293 Outer P.P.I. switchable 960/293 or 960/277/277 Modified for use with Auto-aligning Mark 2	Patt. 66682 Display Unit, Des.32 (inner) Patt. 66683 Display Unit, Des.33 (outer)
JE14F	Coupled pair of P.P.I.s. with Types 960/983/983 or 293Q. or with 960 and 277P/Q (1 or 2 in No.) and 293P/Q (if 1 in No. Type 277): Remote: Inner non-switchable Outer (a) Switchable 960/983/983 or 293Q. (b) Switchable 960/277/277 or 293. Modified for use with Auto-aligning Mark 2.	Patt. 66682 Display Unit, Des.32 (inner) Patt. 66683 Display Unit, Des.33 (outer)
JE21	P.P.I. with Types 281/B/BP/BQ: (Remote): non-switchable: obsolescent.	Patt. 58368 Display Unit, Des.15
JE22A	P.P.I. with Types 271Q, 273Q/QR, 272P/PR, 277P/Q, 291M, 293/M/P/Q, 972M: (Remote): non-switchable.	Patt. 58368 Display Unit, Des.15
JR22AM	P.P.I. with Types 277P/Q or 293P/Q or 982 or 983: (Remote): non-switchable: Modified for use with Auto-aligning Mark 2.	Patt. 66683 Display Unit, Des.34

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Outfit Name	Purpose	Major Unit
JE22B	P.P.I. with Types 293/M/P/Q: (T.I.U. only): non-switchable	Patt. 58370 Display Unit, Des. 17
JE22BM	P.P.I. with Types 293P/Q: (T.I.U. only): non-switchable: Modified for use with Auto-aligning Mark 2	Patt. 66684 Display Unit, Des. 34
JE23	P.P.I. with Types 972/M: (Office): non-switchable	Patt. 59934 Display Unit, Des. 28
JE24	P.P.I. with Types 277/P/Q or 293/M/P/Q: (Remote): weathertight non-switchable.	Patt. 58370 Display Unit, Des. 17
JE24M	P.P.I. with Types 277P/Q or 293P/Q: (Remote): weathertight non-switchable: Modified for use with Auto-aligning Mark 2	Patt. 66684 Display Unit, Des. 34
JE25B	P.P.I. with Types 281/277 or 293 series, or with 960/277 or 293 series: (Remote): switchable 2 ways.	Patt. 58572 Display Unit, Des. 21
JE25EM	P.P.I. with Types 960 and 293P/Q, or with 960 and 277P/Q: or with 960/982: (Remote): switchable 2 ways: Modified for use with Auto-aligning Mark 2	Patt. 66686 Display Unit, Des. 36
JE26A	P.P.I. with Types 277/293 series: (Remote): switchable 2 ways.	Patt. 58370 Display Unit, Des. 17
JE26AM	P.P.I. with Types 277P/Q and 293P/Q, or with 982/982: (Remote): switchable 2 ways: Modified for use with Auto-aligning Mark 2	Patt. 66684 Display Unit, Des. 34
JE26B	P.P.I. with Types 277/293 series (T.I.U. only): switchable 2 ways	Patt. 58370 Display Unit, Des. 17
JE26BM	P.P.I. with Types 277P/Q, or with 982 and 293P/Q: (T.I.U. only): switchable 2 ways: Modified for use with Auto-aligning Mark 2.	Patt. 66684 Display Unit, Des. 34
JE26C	P.P.I. with Types 293/277 series: (operation rooms of ships armed with torpedoes): switchable 2 ways.	Patt. 58370 Display Unit, Des. 17
JE26CM	P.P.I. with Types 293P/Q and 277P/Q: (operation rooms of ships armed with torpedoes): switchable 2 ways: Modified for use with Auto-aligning Mark 2.	Patt. 66684 Display Unit, Des. 34
JE27A	P.P.I. with Types 277/293 series: (Remote): weathertight: switchable 2 ways.	Patt. 58370 Display Unit, Des. 17
JE28	P.P.I. with Types 291M/293 series: (Remote): switchable 2 ways.	Patt. 55466 Display Unit, Des. 31
JE29B	P.P.I. with Types 281 or 960/277/293 series: (Remote): switchable 3 ways.	Patt. 58572 Display Unit, Des. 21
JE29BM	P.P.I. with Types 960 and 277P/Q, and 277P/Q or 293P/Q: (Remote): switchable 3 ways: Modified for use with Auto-aligning Mark 2	Patt. 66686 Display Unit, Des. 36
JE29C	P.P.I. with Types 960/982/982: (R.D.R. & A.D.R. only): switchable 3 ways: Modified for use with Auto-aligning Mark 2	Patt. 66686 Display Unit, Des. 36
JE30	P.P.I. with Types 277/277/293 series: (Remote): switchable 3 ways	Patt. 58370 Display Unit, Des. 17
JE30M	P.P.I. with Types 293Q/982/982 or with 293P/Q and 277P/Q and 277P/Q: (Remote): Switchable 3 ways: Modified for use with Auto-aligning Mark 2.	Patt. 66684 Display Unit, Des. 34

NOTE

Each Display Outfit contains all the necessary stores (display units, junction boxes, switchgear etc.) to allow it to be fitted and to operate in the specific positions and with the particular sets for which it is required. Wherever any difference in the stores required to make up complete Display Outfits exists, separate Display Outfit names have been introduced in order to facilitate the allocation of the appropriate stores.

RESTRICTED

DISPLAY OUTFITS JDA SERIES

JDA

SUMMARY OF DATA

PURPOSE

A series of general purposes P.P.I. displays employing fixed-coil deflection and other improved operational facilities, introduced to supersede the JE/JCA/B/C Series displays.

BRIEF DESCRIPTION

The Display Outfit JDA series include facilities for off-centring, continuous range scale expansion and inter-lacing of electronic markers from an external source. Orthogonal fixed deflection coils are used and although the display is normally a P.P.I. It can be used with additional units for other applications (eg 'B' Display, Height Finding Display and D.F. Display). A nine-inch cathode ray tube is used and is supported in a self-centring mounting. The following Range Scales are provided:-

Range 1 1-10 Tactical Miles, Max. P.R.F. 3000 Hz
 Range 2 1-20 Tactical Miles, Max. P.R.F. 3000 Hz
 Range 3 1-40 Tactical Miles, Max. P.R.F. 1600 Hz
 Range 4 1-80 Tactical Miles, Max. P.R.F. 800 Hz
 Range 5 1-180 Tactical Miles, Max. P.R.F. 400 Hz
 Range 6 External Range Scale.

Range accuracy is better than $\pm 1\frac{1}{2}\%$ of full scale, with reference to internal markers. Bearing accuracy is better than $\pm 1\frac{1}{2}^\circ$ over the outer threequarters of range scale. The various outfits of the JDA series with their application and approximate JCA Series equivalents are tabulated overleaf.

MAJOR UNITS

Pattern No.	Description
64690	Cabinet, Des. 187, Display
64692	Display Unit 51Z
64691	Cabinet, Des. 188, Power
64693	Door Assembly, Power

PHYSICAL DATA

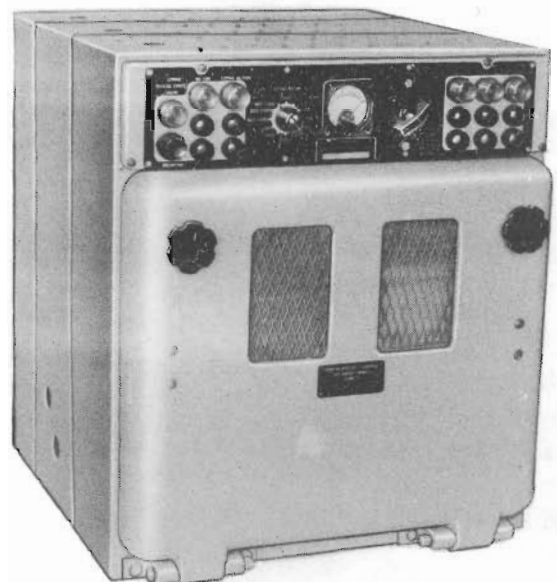
	Height	Weight	Depth	Weight
Cabinet, Des. 187	21 $\frac{1}{4}$ in	19 $\frac{1}{4}$ in	28 $\frac{1}{2}$ in	275 lb (inc. Display Unit)
Cabinet, Des. 188	21 $\frac{1}{4}$ in	18 $\frac{1}{2}$ in	21 $\frac{1}{4}$ in	255 lb (inc. Door Assembly)

POWER REQUIREMENTS AND CONSUMPTION

Mains Input	115 V 50-60 Hz, 1 ϕ , 8A or 230 V 50-60 Hz, 1 ϕ , 4A or 440 V 50-60 Hz, 1 ϕ , 2.1A or 200 V 400 Hz 1 ϕ , 4.6A
Fans Supply	115 V 50-60 Hz, 1 ϕ , 1.3A or 230 V 50-60 Hz, 1 ϕ , 0.65A
Anti-condensation Heaters	115 V 50-60 Hz, 1 ϕ , 0.7A or 230 V 50-60 Hz, 1 ϕ , 0.7A } or d.c.
Servo System Magslip	115 V 400 Hz 30 W



DISPLAY UNIT 51Z



CABINET, DES. 188, POWER

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Outfit Name	Approx. Equivalent JCA series	Application
JDA 1	JCB 2/M, 4/M, 13/M	Air Reporting 960, 982, 983, 277, 293, 965, REJ etc.
JDA 2	JCB 13/M	Interception and Sea-Air Plot Homing and Marshalling - 960, 982, 983, 984, 277, 293, 965, REJ, 992, 978 etc. Reflection Plotting P.P.I. for subdued lighting conditions.
JDA 3	JCB 1/M, 14/M	(a) Surface Reporting 960 (IFF.10) 982, 983, 277, 293, 978, 992, REJ. (b) Surface Reporting Display associated with Outfit JUA 960 (IFF.10) 982, 983, 277, 293, 978, 965, REJ.
JDA 4	JCC 2/M, JCB 10/M	Torpedo Line of Sight Indicator/Surface Reporting 992, 293, 978, REJ.
JDA 5	None	Transmission of Range and Bearing to UCSF2 Surface Reporting 278, 293, REJ.
JDA 6	JCB 11/M	TIU5 - 992, 982, 983, 277, 293, 965, REJ
JDA 7	JCB 12/M	BFSU4 - 992, 982, 983, 277, 293, 965, REJ.
JDA 8	None	C.C.A. 984, 963, 960, 982, 277, 293.
JDA 9	None	Interception and Sea-Air Plot Homing and Marshalling 960 (IFF.10), 982, 983, 277, 293, 978, 984, 992, REJ. Reflection Plotting P.P.I. for daylight conditions.
JDA 10	None	977
JDA 11	JCC 1/M	Azicator 960, 982, 992, 965.
JDA 12	None	Range-Height Indicator, 2770, 983.
JDA 13	None	965 Office
JDA 14		

HEAT DISSIPATION

Display Cabinet Assembly 550 W approx.
Power Cabinet Assembly 550 W approx.

REMARKS

The Power Cabinet Assembly can be installed up to 300 cable ft from the Display Cabinet Assembly for all normal installations.

HANDBOOK

BR 1145(1)(2)

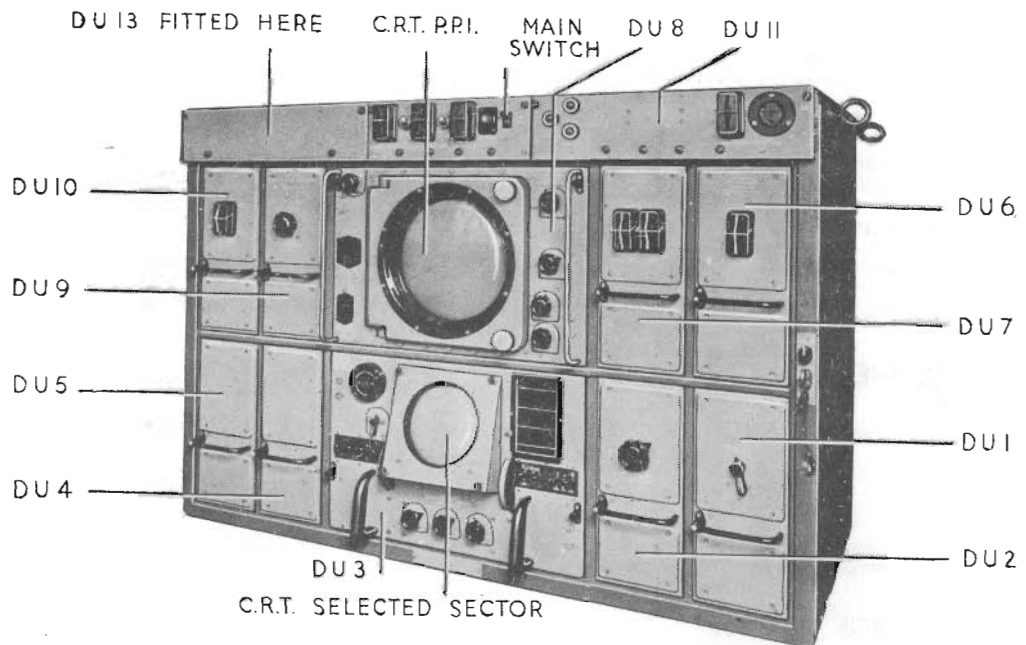
ESTABLISHMENT LIST

E 1159

INSTALLATION SPECIFICATION

B 859

RESTRICTED

RESTRICTEDBR 333(1)
Original**DISPLAY OUTFITS JL AND JM****JL
JM****SUMMARY OF DATA****PATT. 57104 DISPLAY PANEL, DESIGN 1****PURPOSE**

Display Outfits JL and JM utilise the Universal Display Unit. The variations of these equipments and their functions are:-

- (a) Display Outfit JL1 Fitted with Type 960 not modified for Auto-aligning Mark 2 as (i) the Type 960 office display (ii) remote in the R.D.R. for height estimation purposes and (iii) the spare Universal Display Unit.
- (b) Display Outfit JL1M Fitted with Type 960 modified for Auto-aligning Mark 2 and performing same functions as display Outfit JL1.
- (c) Display Outfit JM1 Fitted with Types 960/277 where Types 960 and 277 are not modified for Auto aligning Mark 2 in the R.D.R. and switchable between Type 960 and 277 (1 or 2 in number).
- (d) Display Outfit JM1M Fitted with Types 960/982/242Q or with Types 960/277/242P where Types 960 and 277 have been modified for Auto aligning Mark 2 in the R.D.R. for the remote display of interrogation and switchable Types 960 and 982 (1 or 2 in number) or 277 (1 or 2 in number).

BRIEF DESCRIPTION

The Display Outfit contains two separate displays

- (a) P.P.I. (b) A trace or A trace sector selector or B trace sector selector.
- (a) A nine inch P.P.I. tube with a long after-glow is used. Ranges available are (i) 20 miles (ii) 100 miles (iii) 200 miles and a motor driven range marker is supplied with a Veeder type range counter for reading off accurate ranges. A motor driven Bearing cursor is also provided. Calibration pips in the form of concentric circles appear at 1 or 10 mile intervals as required.
- (b) The A trace has an upper and a lower trace on a 6 inch tube which has an after-glow of up to ten seconds. The upper trace presents a static picture of a selected sector as chosen by the bearing cursor so that the echoes on the particular sector (2° to 8°) may be examined in greater detail than on the P.P.I. display. This A trace can be expanded for any 20 mile portion to cover the full width of the tube so that groups of echoes may be examined in more detail. The interrogation is presented on the lower trace, the echoes appearing as downward pulses. Both the Radar picture and the Interrogator picture can be made to display continuously.
- (c) Any B trace sector of 90° can be displayed on the same C.R.T. as chosen by the position of the bearing cursor. Expanded range is available.

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MAJOR UNITS

DU1	58799	Range Calibrator, Design 4	DU10	58808	Rectifier Unit, Design 106
DU2	58800	Amplifier Unit Video, Design 3	DU11	58809	Switch Unit, Design 34
DU3	58801	Cathode Ray Unit, Design 37	DU12	58797	Switch Unit, Design 32
DU4	58802	Time Base Unit, Design 27	DU13	58810	Control Unit, Design 40
DU5	58803	Generator (Strobe) Unit, Design 2	(Display Outfits JL1 and JL1M only)		
DU6	58804	Rectifier Unit, Design 104			
DU7	58805	Rectifier Unit, Design 105			
DU8	58806	Display Unit, Design 23			
or					
DU8	66691	Display Unit, Design 37			

Unit DU8, Patt. 58806 is fitted in Display Outfits JL1 and JM1 only
Unit DU8, Patt. 66691 is fitted in Display Outfits JL1M and JM1M only)

Unit DU1 to DU13 inclusive are fitted in one of the following:

DU14	57104	Display Panel, Design 1 (Display Outfits JL1 and JM1 only)
or		
DU14	66687/A	Display Panel, Design 3 (Display Outfits JL1M and JM1M only)

ANCILLARY EQUIPMENT

Ancillary equipment for these outfits is supplied as part of A.I.C. Outfits PDA, PDB and PDC.

PHYSICAL DATA

The space required is 3 ft 7 $\frac{1}{4}$ in by 2 ft 2 in by 4 ft 10 in high
Weight of equipment is 750 lb

POWER REQUIREMENTS

(i) 180 volts, 500 Hz - 5 amps (ii) 220 volts, D.C. - 1 amp (iii) 22 volts, D.C. - 5 amps.

A gyro supply for one Mark 10 'M' type motor is also required.

HEAT DISSIPATION

1 kW

REMARKS

As the Display Panel, Design 1 or 3 generates 1 kW of heat, forced ventilation of 200 cubic feet of air per minute is necessary.

HANDBOOK

BR 1765(1)(2)

ESTABLISHMENT LIST

E 852

INSTALLATION SPECIFICATION

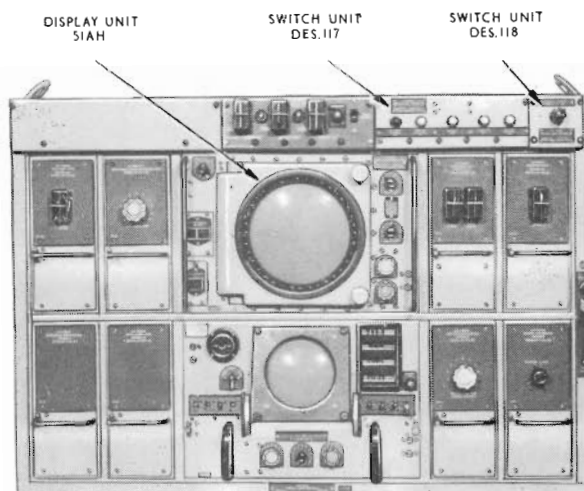
B 556

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DISPLAY OUTFITS JLIP AND JMIP

JLIP
JMIP

SUMMARY OF DATA

DISPLAY PANEL DES.5
AP 70110

PURPOSE

Display Outfits JL1P and JM1P are fitted, in conjunction with Type 960, in certain new construction and modernised ships.

BRIEF DESCRIPTION

Display Outfits JL1P and JM1P are modified versions of Display Outfits JL1M and JM1M. The difference between the M and P versions of these Display Outfits is in the method of controlling the scan coils of the P.P.I. tubes in the Display Units. In Display Outfits JL1M and JM1M the scan coils are driven by "M" type motors. In Display Outfits JL1P and JM1P the scan coils are driven by a magslip controlled servo system. In all other respects the M and P versions of these Display Outfits are identical.

MAJOR UNITS

	AP No.	Description
DU1	58799	Range Calibrator Design 4
DU2	58800	Amplifier Unit, Video Design 3
DU3	58801	Cathode Ray Unit Design 37
DU4	58802	Time Base Unit Design 27
DU5	58803	Generator, Strobe Design 2
DU6	58804	Rectifier Unit Design 104
DU7	58805	Rectifier Unit Design 105
DU8	70111	Display Unit 51AH
DU9	58807A	Time Base and Video Amplifier Unit
DU10	58808	Rectifier Unit Design 106
DU11	(71332)	Switch Unit Design 117
	(71333)	Switch Unit Design 118
DU12	58797	Switch Unit Design 32
DU14	70110	Display Panel Design 5
The following units are special fitting for Display Outfits JL1P and JM1P		
DU8	70111	Display Unit 51AH
DU11	71332	Switch Unit Design 117
DU11	71333	Switch Unit Design 118
DU14	70110	Display Panel Design 5
all other units are identical to those fitted in Display Outfits JL1M and JM1M		

POWER REQUIREMENTS

- (i) 180 V 500 Hz 5 amp
- (ii) 220 V d.c. 1 amp
- (iii) 22 V d.c. 5 amp
- (iv) 115 V 400 Hz

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HANDBOOK

BR 1765(1)(2) Addendum No. 1

ESTABLISHMENT LIST

E 852

INSTALLATION SPECIFICATION

B 640/R3

RESTRICTED

RESTRICTEDBR 333(1)
Original**DISPLAY OUTFIT JP2 AND CONSOLE LOWER ASSEMBLY****JP2****SUMMARY OF DATA****PURPOSE**

Display Outfit JP2 (Type 1000/1 Series) is a P.P.I. display for use with a submarine warning radar designed to transmit range and relative bearing to a torpedo computer.

BRIEF DESCRIPTION

Display Outfit JP2 consists of two Display Panels Design 4 and R.B.U.s. Design 5, one of each being fitted in the Radar Office and Control Room. The Radar Office part of the JP2 Display is mounted on the Console Lower Assembly. The rectifier units for both Display Panels are in the Console Control Unit Lower Left. The Lower Assembly. The rectifier units for both Display Panels are in the Console Control Unit Lower Left. The Control Unit Upper is mainly concerned with aerial control.

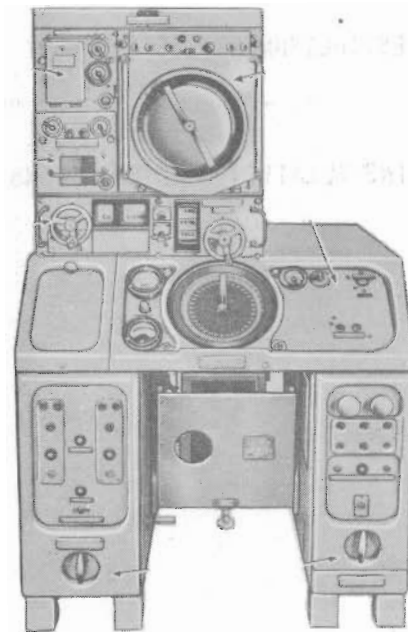
MAJOR UNITS

- | | | | |
|-----|------------|--|-----------------------------------|
| (a) | AP 59991/A | Display Unit Design 29 | } AP 64073 Display Panel Design 4 |
| (b) | AP 64072 | Time Base Unit 72S | |
| (c) | AP 59992 | Mixer Unit Design 10 | |
| (d) | AP 61421A | Range and Bearing Unit Design 5 | |
| (e) | AP 67043 | Control Unit Upper Design 3 ('T' Class Conversions) or | |
| | AP 68541 | Control Unit Upper Design 127 (Porpoise Class) | |
| (f) | AP 65711 | Control Unit Lower Left Design 2 | |
| (g) | AP 65712 | Control Unit Lower Right Design 2 | |

PHYSICAL DATA

Weight	:	Display Panel Design 4 and R.B.U. Design 5,	500 lb
	:	Console + Display Panel Design 4 and R.B.U. Design 5,	1130 lb
Dimensions	:	Width of Console	: 2 ft 10 in
	:	Width of Display Unit	: 22 in
	:	Height of Console + Display Unit	: 4 ft 9 in
	:	Depth of Console	: 2 ft 8½ in
	:	Depth of Display Unit	: 22 in

GENERAL VIEW

**POWER REQUIREMENTS**

180 V 500 Hz at 500 W for rectifier units
 220 V d.c. at 400 W for heaters and interlocks
 24 V d.c. essential at 140 W max. for gyro M-transmission etc.
 24 V d.c. non-essential at 207 W local M-transmission etc.
 230 V 50 Hz at 500 W for selsyns ('T' Class Conversions only)
 115 V 60 Hz 3 phase at 350 W for aerial motor (Porpoise Class only)
 115 V 400 Hz for magslips in R.B.U. Gyro Supply

HEAT DISSIPATION

Display Outfit JP2	:	250 W each display, Office and Plot
Console Lower Assembly	:	200 W

POWER SUPPLY OUTFITS

'T' Class Conversions	:	Power Supply Outfit DXF (180 V and 230 V a.c.) and D.E.E. 24 V and 220 V d.c. supplies
Porpoise Class	:	Power Supply Outfit DUL (180 V a.c.) and D.E.E. 24 V and 220 V d.c. supplies

ELECTRICAL CHARACTERISTICS

Type of Display	:	8 inch diameter P.P.I., true North stabilised at 12 o'clock.
Range of Scan	:	(A) 6000 yards, (B) 15 000 yards, (C) 60 000 yards.
Range Indication	:	By positioning a strobe spot with a range handwheel.
Bearing Indication	:	By positioning a cursor with a bearing handwheel.
Calibration	:	2000 yard markers from tuned L.C. circuit.
Inputs	:	Sync and Signal from Transmitter-Receiver Radar 77A. Ship's head 24 V control circuit. Gyro
Outputs	:	Magslip range and relative bearing to T.C.S.S.3.

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BR 1158

ESTABLISHMENT LISTS

JP2 - E847, DXF - E735, DUL - E524

INSTALLATION SPECIFICATIONS

Radar Type 1000 Series : B 821
Power Supply Outfit DXF : B 723
Power Supply Outfit DUL : B 687

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RESTRICTEDBR 333(1)
Original**DISPLAY OUTFIT JP3****JP3****SUMMARY OF DATA****PURPOSE**

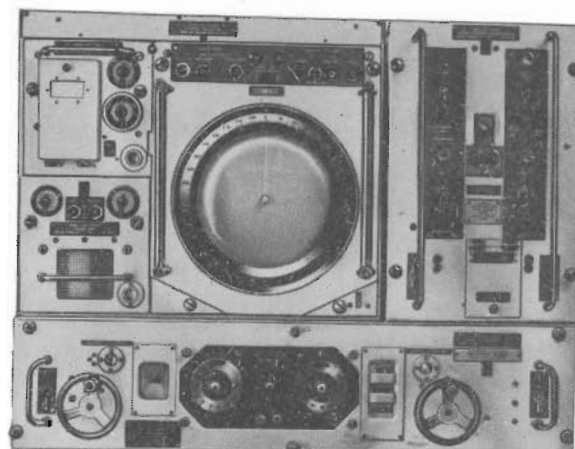
Display Outfit JP3 is a P.P.I. Display for use with a submarine warning radar and is designed to transmit range and relative bearing to a torpedo computer.

BRIEF DESCRIPTION

The Display Outfit JP3 consists of a plan position indicator associated with a Range and Bearing Unit which provides magslip data for the Torpedo Computer. A Sector Selector Unit, mounted in the Range Bearing Unit, is part of the aerial outfit and is housed in the Range and Bearing Unit purely for convenience.

MAJOR UNITS

5840-AP 173040	Cabinet Indicator
5840-AP 173042	Generator Sweep
5840-AP 172291	Mixer Unit
5840-AP 173041	Indicator Plan Position
5840-AP 173044	Range and Bearing Unit
5840-AP 173045	Cabinet Control Power Supply
5840-AP 173046	Power Supply
AP 204150	Servo Amplifier Mk. 4 A.C.



DISPLAY OUTFIT JP3

PHYSICAL DATA

Weight	Cabinet Control and Power Supply	108 lb	
	Cabinet Indicator	250 lb	
	Range and Bearing Unit	169 lb	
Dimensions Overall	2 ft 10 in wide	2 ft 3 in high	2 ft 2 in deep

POWER REQUIREMENTS

180 V 500 Hz (or 200 V 400 Hz) at 450 W for Rectifier Unit.
 200 V d.c. or 240 V a.c. for anti-condensation heaters.
 24 V d.c. for M-type and lamps.
 115 V 400 Hz 80 W for magslips and servo amplifier.

HEAT DISSIPATION

Display Outfit JP3 - 450 W

ELECTRICAL CHARACTERISTICS

Type of Display	8 inch diameter P.P.I. True North stabilised at 12 o'clock.
Ranges of Scan	(a) 6000 yards at high or low p.r.f. (b) 15 000 yards at high or low p.r.f. (c) 60 000 yards at low p.r.f.
Range Indication	Positioning a strobe spot by means of a range handwheel.
Bearing Indication	Positioning a cursor by means of a bearing handwheel.
Calibration	2000 yard markers from a tuned L C circuit.
Inputs	Sync and signal from Transmitter-Receiver Radar Type 77A Ships Head control circuit, 24 V Gyro Compass magslip. True aerial bearing data.
Outputs	Magslip range and relative bearing to computer.

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BR 2321

ESTABLISHMENT LIST

E 1266

INSTALLATION SPECIFICATION

Radar Type 1000 series - B 821

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DISPLAY OUTFITS JP4/5

JP4/5

SUMMARY OF DATA

PURPOSE

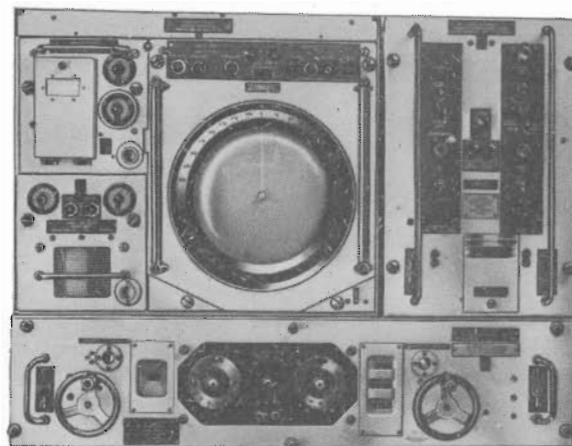
Display Outfit JP4/5 is a P.P.I. Display for use with a submarine warning radar and is designed to transmit range and relative bearing to a torpedo computer.

BRIEF DESCRIPTION

Display Outfit JP4/5 consists of a P.P.I. associated with an R.B.U. that provides magslip data for the Torpedo Computer. A Sector Selector Unit, part of the aerial outfit is mounted in the R.B.U. for convenience. JP4 only differs from JP5 in having AP 61421A R.B.U. (as for Display Outfit JP2) instead of 5840-AP 173164 R.B.U.. Where fitted, conditioning heaters are dual voltage, ie 220 V d.c. or 115 V a.c. 60 Hz.

MAJOR UNITS

5840-AP 173253	Cabinet Indicator
5840-AP 173120	Generator Sweep
5840-AP 173122	Mixer Unit
5840-AP 173121	Indicator Plan Position
5840-AP 173164	Range and Bearing Unit
(AP 61421A for JP4 only)	
5840-AP 173254	Cabinet Control Power Supply
5840-AP 173046	Power Supply
AP 204150	Servo Amplifier Mk. 4 A.C.



JP4 - uses AP 61421A R.B.U.
JP5 - uses 5840-AP 173164 R.B.U.

PHYSICAL DATA

Weight	Cabinet Control and Power Supply	108 lb
	Cabinet Indicator	250 lb
	Range and Bearing Unit	169 lb
Dimensions Overall	2 ft 10 in wide, 2 ft 3 in high, 2 ft 2 in deep.	

POWER REQUIREMENTS

180 V 500 Hz (or 200 V 400 Hz) at 450 W for Rectifier Unit.
220 V d.c. or 115 V a.c. 60 Hz for anti-condensation heaters.
24 V d.c. for M type and lamps.
115 V 400 Hz 80 W for magslips and servo amplifier.

HEAT DISSIPATION

Display Outfit JP4/5 - 450 W

ELECTRICAL CHARACTERISTICS

Type of Display	8 inch diameter P.P.I. True North stabilised at 12 o'clock.
Range of Scan	(a) 6000 yards at high or low p.r.f. (b) 15 000 yards at high or low p.r.f. (c) 60 000 yards at low p.r.f.
Range Indication	Positioning a strobe spot by means of a range handwheel.
Bearing Indication	Positioning a cursor by means of a bearing handwheel.
Calibration	2000 yard markers from a tuned L C circuit.
Inputs	Sync and signal from Transmitter-Receiver Radar Type 77A. Ship's Head control circuit, 24 V. Gyro Compass magslip. True aerial bearing data.
Outputs	Magslip range and relative bearing to computer.

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HANDBOOK

BR 2321

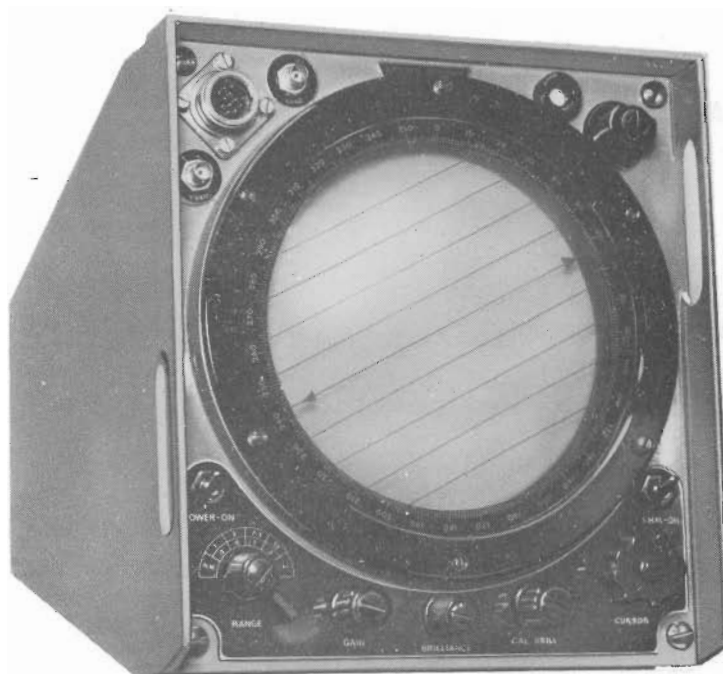
ESTABLISHMENT LIST

E 1265

INSTALLATION SPECIFICATION

Radar Type 1000 series - B82

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RESTRICTEDBR 333(1)
Original**DISPLAY OUTFIT JQ****JQ****SUMMARY OF DATA**

Ranges (in h.m.)	Cal. Ring Interval	Range Discrimination
1	0.2	Not more than the radar pulse length
3	0.5	Bearing Discrimination
7.5	1	Better than the angular beam width of the aerial.
15	3	Bearing Accuracy
Range Accuracy		Better than 1½°
Better than 1% of the range in use, or 50 yards, whichever is the greater.		
Cal. Ring Accuracy		
Better than 1½% of the range in use.		

BRIEF DESCRIPTION

A 9 inch watertight, lightweight and portable, but not pressure tight P.P.I. Display (Indicator, Azimuth/Range) for use as a Submarine Navigational Bridge Display, working from Radar Types 1002/3 only. Display Outfit JQ includes a hood, a visor, a C.R.T., certain spares and all connections. It provides a stabilised, north-up presentation and a Ship's Head Marker. Weight 38 lb, overall dimensions 16 inches by 13½ inches by 13½ inches. Desiccated. Will operate efficiently for periods of up to 120 hours without breakdown or attention except for adjustment of operational control.

MAJOR UNITS

5840-99-519-9869	Indicator, Azimuth/Range
5840-99-519-9873	Power Supply (Board 1)
5840-99-520-3070	Panel, Electronic Circuit (Board 2)
5840-99-519-9870	Sweep Generator, Calibrator (Board 3)
5840-99-519-9871	Amplifier, Video and Misc. Circuit Board. (Boards 4 and 5)
5960-99-037-5739	C.R.T.
5840-99-519-9872	Amplifier, Electronic Control (Servo)

POWER SUPPLIES

It operates from any one of the following:

115 V ± 5%	400 Hz ± 2½%
180 V ± 5%	500 Hz ± 2½%
200 V ± 5%	400 Hz ± 2½%

RESTRICTED

RESTRICTED

RADAR PARAMETERS

Input Sync. : 400 - 2000 P.R.F.
Pulse Duration : 0.1 - 10 μ s
Pulse Amplitude : 7 - 40 V
Video Pulse : 5 V peak into 70 ohm
Time Base Rotation : 5 and 10 rev/min

COMPASS SAFE DISTANCE

Compass Grade

1	11 and -11	.1V
3 feet	2 feet	1.5 feet

ASSOCIATED EQUIPMENT (AND HANDBOOK)

Radar Type 1002/1003 : (CB 4907)
Aerial Outfit AKU(3)(4) : (CB 3346, Addendum 1)

ESTABLISHMENT LIST

R 1506

PROCUREMENT SPECIFICATION

27988

INSTALLATION SPECIFICATION

B 1125

HANDBOOK

BR 2937

RESTRICTED

DISPLAY OUTFIT JS

JS

SUMMARY OF DATA

PURPOSE

Display Outfit JS is installed in the Radar Display Room of ships fitted with Type 983 and is used as the height-finding display for that set.

BRIEF DESCRIPTION

Display Outfit JS consists of Panel L48, which contains a cathode ray tube display, giving effectively a side elevation expanded in height of the area swept by the Aerial Outfit AQT (Type 983) controlled by Control Unit 20Q/S for height-finding.

The target radar echo is presented as a short vertical line on the cathode ray tube, height is obtained by bisecting the echo with an electronic cursor, which is corrected for the earth's curvature, and controlled by a hand wheel. The height is indicated on a counter drum.

MAJOR UNITS

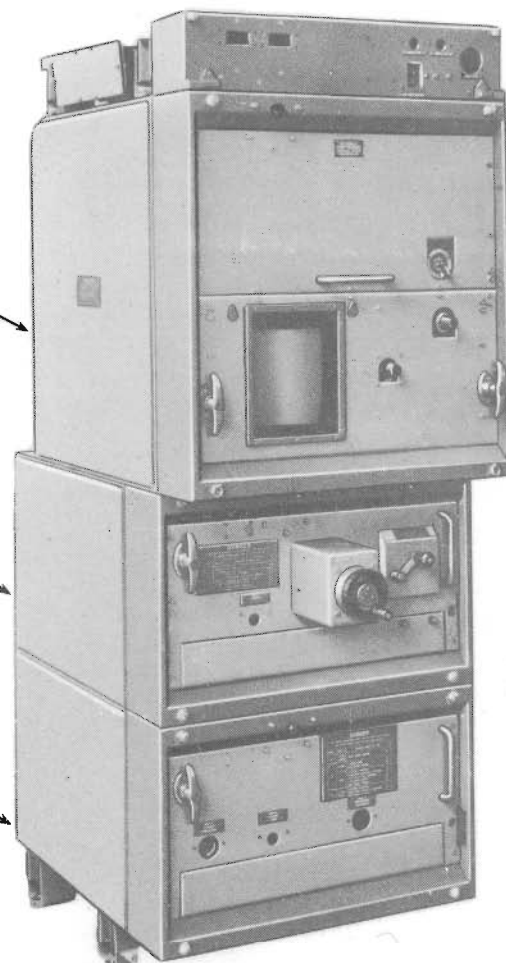
AP No.	Description
1. 56990	Rectifier Unit, Design 67
2. 57474	Panel L48 Height Display (Upper)
3. 57475	Cursor Control Unit
4. 57476	Time Base Unit, Design 21
5. 57477	Limiter and Synch Distributing Unit
6. 57478	Calibrator Unit, Design 7
7. 57479	Time Base Unit, Design 22
8. 57480	Amplifier Unit, Video, Design 1
9. 57481	Rectifier Unit, Design 70
10. 57482	Rectifier Unit, Design 71
11. 57484	Rectifier Unit, Design 72
12. 57485	C.R. Tube Control Unit for Panel L48
13. 57486	Body for AP 57485 C.R. Tube Control Unit
14. 57487	Deflection Coil Unit for AP 57485 C.R. Tube Control Unit
15. 57488	Control Board for AP 57485 C.R. Tube Control Unit
16. 57489	Scale Mounted and illuminated for AP 57485 C.R. Tube Control Unit
17. 57491	Panel L48 Height Display (Middle)
18. 57492	Panel L48 Height Display (Lower)
19. 59750	Rectifier Unit Des. 114 for deflector coil shift current
20. 59751	Potentiometer Unit (Cursor) with counter mechanism
21. 65629	Control Unit, Sector Elevation Design 2

Items 3, 4, 5, 6, 7, 8 and 12 are components of Item 2
 Items 13, 14, 15 and 16 are components of Item 12
 Items 1, 9, 20 and 21 are components of Item 17
 Items 10, 11 and 19 are components of Item 18

2 COMPRISING
3, 4, 5, 6, 7, 8 & 12

17 COMPRISING
1, 9, 20 & 21

18 COMPRISING
10, 11 & 19



PANEL 48 - GENERAL VIEW

PHYSICAL DATA

Total Weight of Panel L48 : 700 lb (approx.)
 Overall Dimensions of Panel L48 : 5 ft 1 in high, 1 ft 10 in wide, 2 ft 1 in deep.
 Panel L48 is fitted in the Radar Display Room.

POWER REQUIREMENTS AND CONSUMPTION

180 volts 5pp Hz, 3 phase - 3 amps taken from A.C. Supply Outfit DVJ.

HEAT DISSIPATION

$\frac{3}{4}$ kW

HANDBOOK

ESTABLISHMENT LIST

INSTALLATION SPECIFICATION

BR 2162

E 933

B 629

DISPLAY OUTFIT JT1

JT1

SUMMARY OF DATA

PURPOSE

Display Outfit JT1 is a submarine short ranging display unit for use in conjunction with an X-band transmitter (Types 1000/1/2 Series), periscope aerial and torpedo computer.

BRIEF DESCRIPTION

Display Outfit JT1 is the accurate ranging panel for Transmitter/Receiver Radar 77A and Periscope Aerial Outfit AKS. The Display consists of a 6 inch A-scan long-persistence C.R.T. which is only brightened during the short transmission periods. The strobe spot is only visible after the transmission has ceased. Ranging is carried out in the normal way using the range controls to position the strobe on the after-glow of the target echo. Range data is automatically relayed to the computer by means of a magflip transmitter.

MAJOR UNITS

- (a) Pattern 61327 Cabinet Assembly, Design 26, Rectifying, containing:
 - (1) Unit A, Pattern 61329 Rectifier Unit 63AC
 - (2) Unit B, Pattern 61329 Rectifier Unit 63AC
- (b) Pattern 61360 Cabinet Assembly, Design 27, Range Calibrating, containing:
 - (1) Unit C, Pattern 61361, Range Marker Generator Unit
 - (2) Unit D, Pattern 61363, Switch Unit, Design 6, Calibrate Operate
 - (3) Unit E, Pattern 61362, Calibrator Unit, Design 10
 - (4) Unit M, Pattern 61232, Trigger Unit, Design 13, Pulse Equalising
- (c) Pattern 61364 Cabinet Assembly, Design 28, Display, containing:-
 - (1) Unit F, Pattern 61370, Trigger Unit, Design 12
 - (2) Unit G, Pattern 61366, Time Base Unit 72D
 - (3) Unit H, Pattern 61368, Rectifier Unit 63AD
 - (4) Unit J, Pattern 61367, Amplifier, Video and Pulse Brightening
 - (5) Unit K, Pattern 61365, C.R.T. Unit, Design 6
 - (6) Unit L, Pattern 61369, Range Marker Control and Transmission Unit or 5840-AP 173252
 - (7) Control Unit, containing spare Units F and J (not patternised)

NOTE The Unit letter is marked on the cabinet containing the unit.

PHYSICAL DATA

Height	Width	Depth	Weight
5 ft 4 in	1 ft 6½ in	2 ft 2 in	700 lb

POWER REQUIREMENTS

180 V, 500 Hz or 200 V, 400 Hz, 2.75A for rectifier units etc.
 220 V d.c. 1A for display heaters.
 24 V d.c. 3 A for internal relays.
 115 V 400 Hz for magflip transmitter.

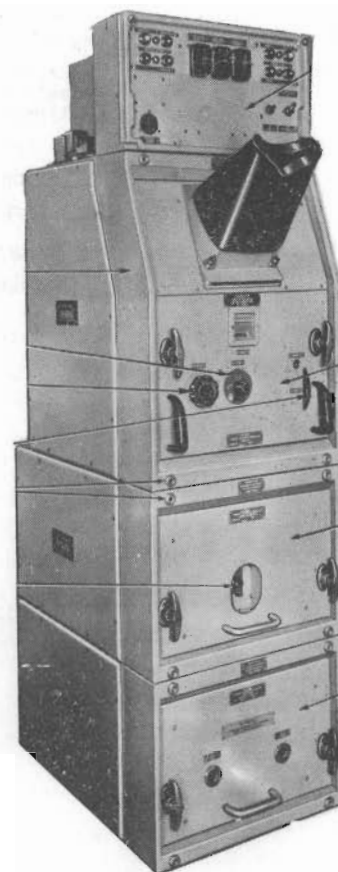
The following supplies are taken from the Display Outfit JT1.

220 V d.c. to the Crosshead Unit
 180 V 500 Hz or 200 V 400 Hz to Control Unit Design 95.

The associated Power Supply Outfit is DXF ("T" Class Conversions) and DUL (Porpoise Class).

HEAT DISSIPATION

500 watts.



DISPLAY OUTFIT JT1

RESTRICTED

ELECTRICAL CHARACTERISTICS

Type of Display : A-scan on 6 inch-long persistence C.R.T.
Range of Scan : 5000 or 20 000 yards.
Range Control : Course range in 1000 yard steps by means of a switch. Fine range continuously by means of a thumb-wheel.
Calibration : A crystal-controlled calibrator produces 1000 yard markers and also sync. pulses at repetition frequencies of 500 and 2500 p.p.s. for triggering the outfit for calibration purposes.
Inputs : (1) Sync and signal from the Transmitter/Receiver Radar 77A.
(2) Control for scan brightening.
(3) Supply to "RANGE CUT" lamp from computer.
Outputs : (1) Magslip range data.
(2) Supply to "RANGE CUT" lamp at computer.

HANDBOOK

BR 940

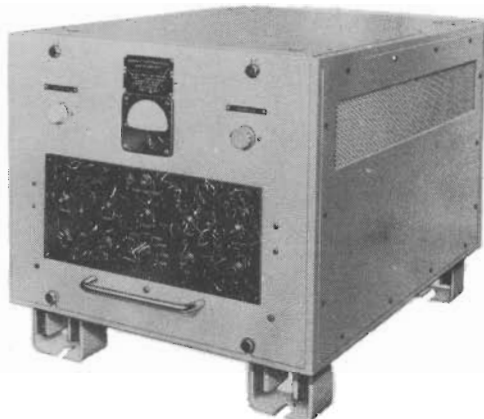
ESTABLISHMENT LISTS

E 1071 (JT1), E 735 (DXF), E 524 (DUL).

INSTALLATION SPECIFICATIONS

B 821 (Types 1000(1)(2), 1001)
B 824 (Type 1002)

RESTRICTED

RESTRICTEDBR 333(1)
Original**DISPLAY OUTFIT JUA****JUA****SUMMARY OF DATA**

AP 103635 DISPLAY POWER UNIT ASSEMBLY



AP 103634 DISPLAY ASSEMBLY

PURPOSE

Display Outfit primarily for use with radar Type 978.

BRIEF DESCRIPTION

The Display Unit employs a 12 inch P.P.I. display having six range scales viz: 1, 2.5, 5, 10, 20 and 40 nautical miles. Timebase linearity is to within 5% of the range of an echo or 2½% of the maximum of the scale in use. Calibration rings or adjustable brilliance are provided at intervals of 0.2, 0.5, 1, 2, 4 and 8 miles for the above ranges respectively (ie five markers for each range scale). Accuracy of calibration rings is within 2% of the indicated range or 1% of the maximum range of the scale in use, or 50 yards. An adjustable range strobe having three range scales of 0.2 - 4 miles 400-18000 yards and 0.4-40 miles is switched independently of the timebase range. Remote indication of range scale is provided by switch contacts and of range marker by a magslip transmitter coupled to the range strobe control. The accuracy of the range strobe is the same as for the calibration rings. An illuminated cursor enables the bearing of an echo anywhere on the display to be read to an accuracy of 1°. Azimuthal stabilisation can be introduced into the magslip transmission from the aerial to the display and a magslip transmitter is coupled to the bearing cursor for remote bearing indication.

The signal circuits include facilities for variable differentiation and adjustable swept gain. A sensitivity control operates variable clipping for use with logarithmic receiver and a gain control for use with linear receiver. An additional control to provide swept clipping for log. receiver is also incorporated and this control can also be used to give swept video gain for linear receiver. A switch selects log. or linear inputs. The minimum range of detectable targets is 50 yards on short pulse and 200 yards on long pulse. On the one-mile range, the equipment is capable of discriminating between two small objects in line, 50 yards apart.

The Display Unit will accept sync. pulses of any amplitude between 2.5 and 30 V, positive polarity, at repetition frequencies between 400 and 3000 p.p.s. The Unit, with its associated power pack, will operate with any radar provided the correct signals, sync. pulse, bearing data, ship's head marker and power supplies are available.

MAJOR UNITS

Part. No.	Description	Physical Data			
		Height	Width	Depth	Weight
103634	Display Unit	1 ft 10 in	1 ft 5½ in	2 ft 2 in	160 lb
103635	Display Power Pack	1 ft 5 in	1 ft 5 in	1 ft 10 in	110 lb

POWER REQUIREMENTS AND CONSUMPTION

115/230 V, 50-60 Hz, 150 W (approx.), 115 V, 400 Hz, to Display Power Unit

100-125 V } a.c. (any frequency) 200 W (approx.) to Display and Power Unit anti-condensation heaters
or 200-250 V }

RESTRICTED

RESTRICTED

REMARKS

An AP 103637 Reflection Plotter, AP 103638 Light Excluding Unit and AP 102682 Visor Assembly can be fitted in the front of the Unit.

HANDBOOK

BR 1156

ESTABLISHMENT LIST

E 1201

INSTALLATION SPECIFICATION

B 882

RESTRICTED

RESTRICTEDBR 333(1)
Original**DISPLAY OUTFIT JUA (3)(4)(5)(6)(7) AND OUTFIT QAA****JUA(3-7)
QAA****SUMMARY OF DATA****PURPOSE**

Display Outfit primarily for use with radar Type 978.

BRIEF DESCRIPTION

The Display Unit employs a 12 inch P.P.1 display having six range scales viz: 1, 2.5, 5, 10, 20 and 40 nautical miles. Timebase linearity is to within 5% of the range of an echo or 2½% of the maximum of the scale in use. Calibration rings of adjustable brilliance are provided at intervals of 0.2, 0.5, 1, 2, 4 and 8 miles for the above ranges respectively (ie five markers for each range scale). Accuracy of calibration rings is within 2% of the indicated range or 50 yards. An adjustable range strobe having three range scales of 0.2-4 miles 400-18000 yards and 0.4-40 miles is switched independently of the timebase range. Remote indication of range scale is provided by switch contacts and of range marker by a magstrip transmitter coupled to the range strobe control. The accuracy of the range strobe is the same as for the calibration rings. An illuminated cursor enables the bearing of an echo anywhere on the display to be read to an accuracy of 1°. Azimuth stabilisation can be introduced into the magstrip transmission from the aerial to the display and a magstrip transmitter is coupled to the bearing cursor for remote bearing indication.

The signal circuits include facilities for variable differentiation and adjustable swept gain. A sensitivity control operates variable clipping for use with logarithmic receiver and a gain control for use with linear receiver. An additional control to provide swept clipping for log. receiver is also incorporated and this control can also be used to give swept video gain for linear receiver. A switch selects log. or linear inputs.

The Display Unit will accept sync. pulses of any amplitude between 7.0 and 30 V, positive polarity, at repetition frequencies between 750 and 2000 p.p.s. The Unit, with its associated power pack, will operate with any radar provided the correct signals, sync. pulse, bearing data, ship's head marker and power supplies are available.

The basic unit of JUA, the Indicator Azimuth Range Track NSN 5840-99-972-4440, is a relative motion display which can be modified by the addition of True Motion Outfit QAA to provide a geographically stabilised display.

MAJOR UNITS

NSN Description		Physical Data			
		Height	Width	Depth	Weight
5840-99-972-4440 Indicator, Azimuth Range Track	JUA(3)	1 ft 10 in	1 ft 5½ in	2 ft 2 in	160 lb
5840-99-972-0943 Housing, Indicator					
Surface ships. Horizontal mounting. Convection cooled					
5940-99-520-8372 Indicator, Azimuth Range Track	JUA(7)	1 ft 10 in	1 ft 5½ in	2 ft 2 in	160 lb
5840-99-521-8130 Housing, Indicator					
Surface ships. Horizontal mounting. Convection cooled. Modified for use with Generator, electronic marker					
NSN 5840-99-520-8112. No True Motion facility.					
5840-99-972-4440 Indicator, Azimuth Range Track	JUA(4)	2 ft 8 in	1 ft 5½ in	2 ft 2 in	160 lb
5840-99-972-4902 Housing, Indicator					
Surface ships. External exhaust forced ventilation. Used with Stand, Indicator NSN 5840-99-919-9043 or					
NSN 5840-99-919-9130.					
5840-99-972-4440 Indicator, Azimuth Range Track	JUA(5)	2 ft 8 in	1 ft 5½ in	2 ft 2 in	160 lb
5840-99-972-4902 Housing, Indicator					
Submarines SSN/SSBN class. External exhaust forced ventilation. Used with Cradle, Azimuth Range Indicator					
NSN 5840-99-972-5307					



DISPLAY OUTFIT JUA(3)(7)



POWER SUPPLY

RESTRICTED

RESTRICTED

NSN Description		Physical Data			
		Height	Width	Depth	Weight
5840-99-972-4440 Indicator, Azimuth Range Track 5840-99-972-4903 Housing, Indicator Submarines, modified "0" class. External exhaust forced ventilation. Used with Cradle, Azimuth Range Indicator NSN 5840-99-519-3516.	JUA(6)	1 ft 10 in	1 ft 5½ in	2 ft 4½ in	160 lb
5840-99-972-1932 Power Supply JUA(3), (5), (6), (7)		1 ft 5 in	1 ft 5 in	1 ft 10 in	110 lb
5840-99-972-4445 Computer, Power Supply 5840-99-972-4446 Control, Track 5840-99-972-4447 Control, Indicator	QAA	1 ft 2½ in 9 in 7 in	1 ft 5 in 1 ft 3½ in 1 ft 5½ in	1 ft 11 in 8 in 6½ in	75 lb 35 lb 31 lb

REMARKS

- (a) 5840-99-919-9043 Stand, Indicator. Tilts to 15° from the horizontal.
 - (b) 5840-99-919-9130 Stand, Indicator. Adjustable between the vertical and 15°, 30° or 90° from the vertical.
 - (c) 5840-99-520-8112 Generator, Electronic Marker. Produces three markers, computer-controlled.
- The following units may be used in conjunction with the Indicator:
- (d) 5840-99-972-2452 Light excluding hood, C.R.T.
 - (e) 5840-99-972-2467 Visor and cowl assembly, C.R.T. complete.
5840-99-523-3653 Visor C.R.T.
 - (f) 5840-99-972-2448 Reflection plotter, Radar data (Direct Plot facility).
 - (g) 5840-99-972-1452 Plotting board, Radar data (for horizontal Indicator).
5840-99-972-1453 Plotting board, Radar data (for tilted Indicator).

* Optical Plotting Attachment.

HANDBOOK

BR 1156

ESTABLISHMENT LIST

E 1201 (JUA)
E 1458 (QAA)

INSTALLATION SPECIFICATION

B 882/R1



JUA(4)

DISPLAY OUTFIT JUC(3)

JUC(3)

SUMMARY OF DATA

PURPOSE AND FITTING

A 9 inch non watertight, P.P.I. display (Indicator, Azimuth/Range) for use with lightweight, Radar Type 975(1) used primarily in small ships for navigational purposes. As compared with the 12 inch displays, JUC(1) and JUC(2), no provision is made for Range and Bearing transmission. In such simplified fittings, Type 975(1) is arranged to work from 24 V d.c. and installations may be either permanent, or wiring arrangements may provide for fitting 'for-but-not-with' the major units, as also for portable fittings. Special cooling arrangements and anti-condensation heaters are not provided.

MAJOR UNITS

NSN	Description	Physical Data			
		Height	Width	Depth	Weight
5840-99-580-5686	Indicator, Azimuth/Range	27 in	20 in	19 in	78 lb
5840-99-580-6534	Power Supply	15 in	13 in	6 in	21 lb
6125-99-580-5931	Motor Generator	17 in	17 in	10 in	123 lb
6105-99-580-5932	Motor, Direct Current (Aerial)	12 in	8 in	8 in	7½ lb

INDICATOR AZIMUTH/RANGE

RANGE

Scales

- (1) 0.5-3.0 nautical miles (these scales continuously adjustable)
 (2) 6 nautical miles
 (3) 12 nautical miles
 (4) 24 nautical miles
 (5) 48 nautical miles

Discrimination: Short pulse, 35 yards;
 Long pulse, 70 yards.

Minimum Range: 35 yards.

Accuracy: Cal. rings, 1.5%; marker, 2.5%.

BEARING

Accuracy: Better than 1°

Discrimination: 6 ft aerial, 1.2°;

RECEIVER: Superheterodyne, with reflex klystron local oscillator. Coaxial crystal mixer, and tunable wideband T.R. cell. Klystron output is fed to the crystal mixer by a directional coupler. I.F. of 60 MHz is fed from the crystal mixer through the pre-amplifier and main I.F. system, the overall bandwidth being 10.5 MHz. Only the I.F. and associated c.r.t. circuits are contained in the Indicator, Azimuth/Range.

MOTOR GENERATOR

Designed for direct, ON-line starting when used with 6110-99-105-5417 Electronic Voltage Regulator. The output voltage is held constant at 180 V a.c. ± 2%, 1100 Hz.

POWER SUPPLY

This provides all derived power supplies other than for (a) the valve heater transformers, which are located in each individual unit.

- (b) The TR cell priming voltage.
 (c) The e.h.t. for the c.r.t.

It distributes 115 V, 50 Hz, 3 phase, generated by the Aerial Motor (580-5932) that drives the deflection coil motor in synchronism with the aerial.

INPUT POWER SUPPLY

Current (Amp)
Start Run

24 V d.c., 450 W

For a Complete Type 975(1) with JUC(3) 160 32

HEAT DISSIPATION

Indicator, Azimuth/Range 170 W
 Power Supply 70 W
 Motor Generator 250 W

RESTRICTED

COMPASS SAFE DISTANCE

The safe distance from the appropriate grade of Compass is:

	GRADE		
	I	II & III	IV
Indicator, Azimuth/Range	8 ft	6 ft	4.5 ft
Power Supply	3 ft	2 ft	2 ft
Motor Generator	14 ft	8.5 ft	7 ft

ASSOCIATED EQUIPMENT

5840-99-580-1392	Transmitter/Receiver, Radar	} See BR 2351 TYPE 975
5985-99-580-1388	Aerial Outfit AZF	
5985-99-580-1387	Monitor, Aerial Radiation	

PROCUREMENT SPECIFICATIONS

Display Outfit JUC(3)	22745
Indicator, Azimuth/Range	24525
Power Supply	22908
Motor Generator	22756
Motor, Direct Current	21394

HANDBOOKS

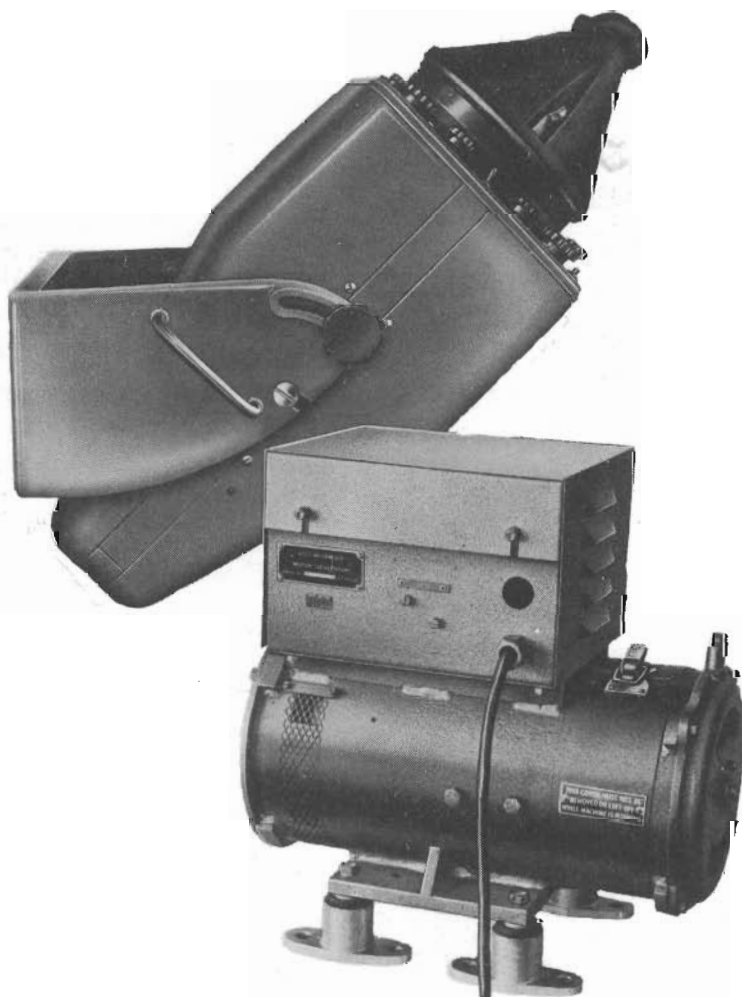
Display Outfit JUC(3)	BR 2351(Addm.)
Type 975 (JUC(1),(2))	BR 2351

ESTABLISHMENT LISTS

Display Outfits JUC(1), JUC(2), JUC(3)	E1351
Type 975(1), (2)	E1349
Aerial Outfits AZF, AZG	

INSTALLATION SPECIFICATION

Types 975(1), (2)	} B913
Aerial Outfits AZF, AZG	
Display Outfits JUC(1),(2),(3)	



DISPLAY OUTFIT JUI

JUI

SUMMARY OF DATA

PURPOSE

Remote Display for Type 974 and Type 964.

BRIEF DESCRIPTION

Display Outfit JUI is the remote display for Type 974. The display unit (P.P.I.) is identical in construction with the main display but it is not wired during installation to permit any control over the Type 974 radar. It has a similar application with Type 964.

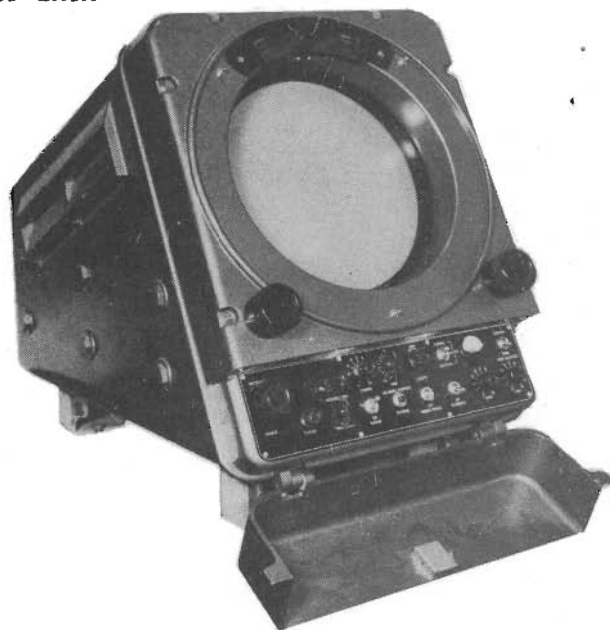
MAJOR UNITS

A.C. Ships

Patt. 100015A Display Unit A.C. 12 in
Patt. 100012 Power Pack for Remote Display

D.C. Ships

Patt. 100006A Display Unit D.C. 12 in
Patt. 100012 Power Pack for Remote Display.



PHYSICAL DATA

PATT. 100006A DISPLAY UNIT D.C. 12 IN

Patt. 100006A Display Unit
or Patt. 100015A Display Unit

Height	Width	Depth	Weight
1 ft 6½ in	1 ft 4½ in	2 ft 1½ in	165 lb

Patt. 100012 Power Pack

1 ft 10 in	1 ft 0 in	11½ in	50 lb
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POWER REQUIREMENTS AND CONSUMPTION

80 V 1000 Hz a.c. to Patt. 100012 Power Pack.

HEAT DISSIPATION

Patt. 100012 Power Pack - 100 watts
Patt. 100006A Display Unit
or Patt. 100015A Display Unit - 105 watts

REMARKS

The difference between Patt. 100015A (A.C. Display) and Patt. 100006A (D.C. Display) is in the different types of switches used for the "Radar On/Off" switch. This switch is not used in the Remote Display and the reason for using a remote display which is the same as the master display is to enable the remote display to be wired up in the master display's position in the event of a serious failure of the master display.

HANDBOOK

BR 1983

ESTABLISHMENT LIST

E 1032

INSTALLATION SPECIFICATION

B 728

DISPLAY OUTFIT JU2

JU2

SUMMARY OF DATA

PURPOSE

Weatherproof remote display used with Type 974.

BRIEF DESCRIPTION

Display Outfit JU2 is a complete weatherproof Display Unit. There are four operating ranges 1, 3, 10 and 25 miles, and calibration markers are provided for these ranges at 1/5, 1/2, 1 and 5 mile intervals respectively.

MAJOR UNITS

Patt. 102650 Display Unit (weatherproof), 5 in
 Patt. 100012 Power Pack for Remote Display.
 Patt. 100011 Junction Box.

PHYSICAL DATA

	Height	Width	Depth	Weight
Patt. 102650 Display Unit	1' 7 $\frac{1}{2}$ "	1' 1 $\frac{1}{2}$ "	1' 6 $\frac{1}{2}$ "	125 lb
Patt. 100012 Power Pack	1' 10"	1' 0"	11 $\frac{1}{4}$ "	50 lb

POWER REQUIREMENTS

80 V 1000 Hz A.C. to Patt. 100012 Power Pack.

HEAT DISSIPATION

Patt. 100012 Power Pack - 100 watts
 Patt. 102650 Display Unit (weatherproof), 5 in - 100 watts

REMARKS

By means of a weatherproof control unit, the display may be converted from slave to master.

HANDBOOK

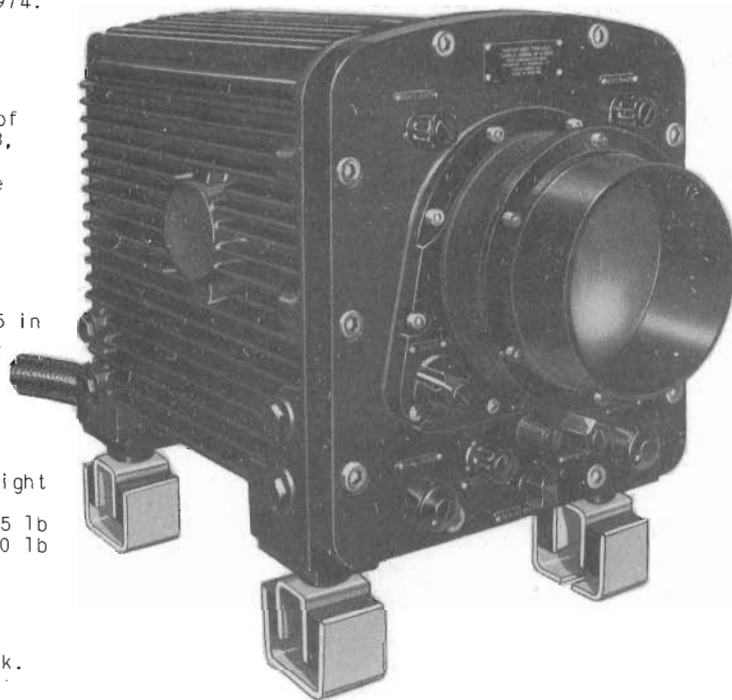
BR 2983 (ADDM)

ESTABLISHMENT LIST

E 1032

INSTALLATION SPECIFICATION

B 728

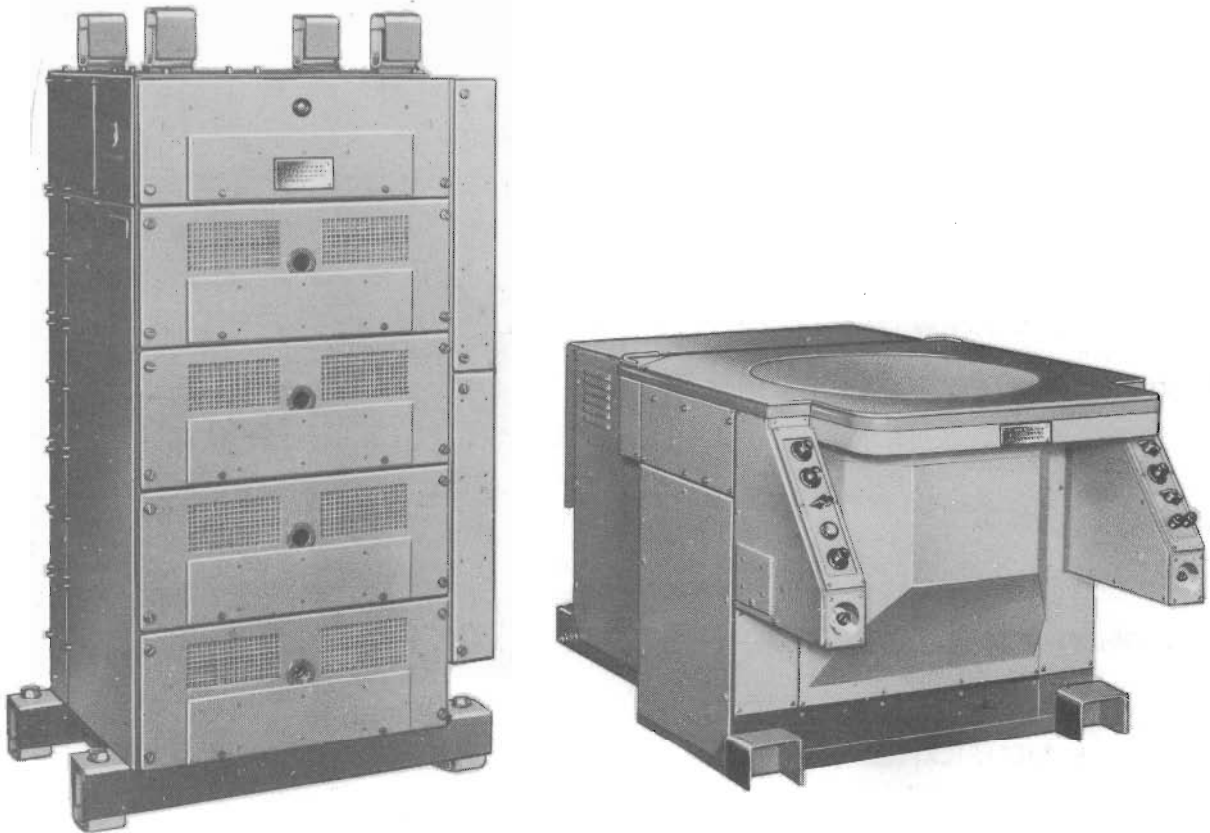


DISPLAY UNIT (WEATHERPROOF) 5 INCH

DISPLAY OUTFIT JW

JW

SUMMARY OF DATA



DISPLAY OUTFIT JW AND POWER SUPPLY CABINET - 4 UNIT

PURPOSE

Display Outfit JW is a projected PP1 display used in Aircraft Direction Rooms and Operation Rooms for air direction and plotting compilation in conjunction with Type 281 series, 277 series, 960, 982, and 983.

BRIEF DESCRIPTION

Display Outfit JW comprises a projection type P.P.I., a Power Pack supplying the various power requirements of the Display Unit; a Bearing Conversion Unit and a Transformer. Range scales available are 180, 120, 90 and 60 nautical miles with provision for selecting one of three radar sets to be displayed. Internal sync. and signal are available for test purposes. Signals are displayed as high intensity "paints" on a C.R.T. screen approx. 2 inches in diameter and magnified to a diameter of approx. 20 inches by means of an optical system. The image is projected on to a horizontal screen which is coated with a fluorescent afterglow layer.

MAJOR UNITS

AP No.	Description	AP No.	Description
1. 61316	Bearing Conversion Unit Des. 3	10. 101707	Brilliance Control and Test Time Base Unit
2. 61503	Transformer Des. 1377	11. 101708	C.R.T. Unit
3. 101700	Display Unit SGM116/25	12. 101709	Control Panel, left
4. 101701	Range Marker Unit	13. 101710	Control Panel, right
5. 101702	Servo Amplifier Unit	14. 101711	Power Supply Cabinet - 4 Unit
6. 101703	E.H.T. Unit 25 kV	15. 101712	Power Supply Cabinet - 2 Unit
7. 101704	Video Amplifier and Focus C Control Unit	16. 101713	Power Supply Unit
8. 101705	Time Base Unit	17. 101714	Optical Mounting Frame Assembly
9. 101706	Smoothing Unit		

NOTES 1. One Item 1 supplied for each Radar set to be displayed (bit 960 only if it is displayed unmixed).
2. One Item 2 only fitted irrespective of number of Display Outfits JW fitted.
3. Items 4 - 13 inc. and Item 17 fitted in Item 3.
4. One Item 14 supplied for four or fewer Outfits JW fitted.
5. One Item 15 to be supplied in addition to Item 14 when 5 or 6 Outfits JW are fitted.
6. Quantities of Item 16 to be supplied are as follows: 4 for each Item 14
2 for each Item 15.

RESTRICTED

PHYSICAL DATA

Pattern No.	Description	Physical Data			
		Height	Width	Depth	Weight
101700	Display Unit SGM116/25	2 ft 4 in	4 ft 2½ in	3 ft 7 in	440 lb
101711	Power Supply Cabinet (containing 4 Power Supply Units)	4 ft 0¾ in	2 ft 4¾ in	1 ft 9 in	448.5 lb
101712	Power Supply Cabinet (containing 2 Power Supply Units)	1 ft 7¼ in	2 ft 4¾ in	1 ft 9 in	226 lb

POWER REQUIREMENTS AND CONSUMPTION

115, 220, 225, 230 or 440 V 50-60 Hz Single Phase 650 W. Voltage tolerance $\pm 5\%$.

180 V 500 Hz 0.75 kW (approx.) (for transformer Des. 1377)

HEAT DISSIPATION (for each display fitted)

Display Unit 300 W approx.
Power Supply Unit 300 W approx.

HANDBOOK

BR 2065(1)-(7).

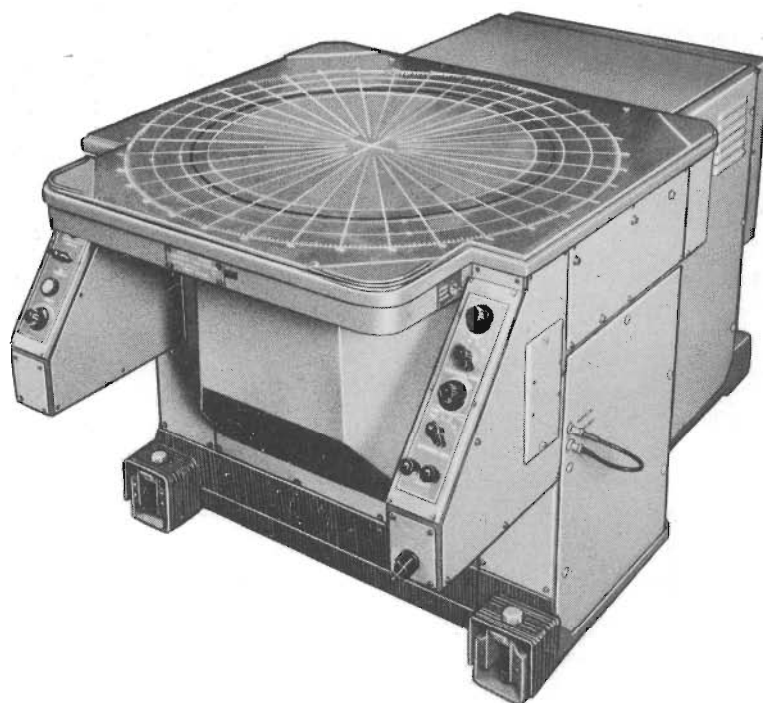
ESTABLISHMENT LIST

E 1060

INSTALLATION SPECIFICATION

B 772

RESTRICTED

RESTRICTEDBR 333(1)
Original**DISPLAY OUTFIT JW(2)****JW(2)****SUMMARY OF DATA**

DISPLAY OUTFIT JW(2)

PURPOSE

Display Outfit JW(2) is a projected P.P.I. display used in aircraft direction and operations rooms normally in conjunction with radar Types 965 series, 978, 982 and 983.

BRIEF DESCRIPTION

Display Outfit JW(2) comprises a projection type P.P.I. display and a separate power pack supplying the various d.c. voltage requirements. Range scales are: 60, 90, 120 and 180/350 nautical miles. Provision is made to select one of three radar inputs to be displayed. Signals are displayed as high intensity echoes on a c.r.t. screen approximately two inches in diameter and magnified by an optical system to a diameter of approximately 20 inches. The image is projected on to a horizontal display screen coated with a fluorescent layer to provide afterglow.

MAJOR UNITS

AP No.	Description	AP No.	Description
1. 103249	Indicator, Plan Position (includes items 2 to 14)	12. 103247	Control Indicator (Right).
2. 101701	Calibrator (Range Marker) Unit 503	13. 101714	Optical Mounting Framework Assembly (Schmidt Optical Box).
3. 101702	Servo Amplifier Unit 504	or 105229	
4. 101703	25 kV e.h.t. Unit 508 (includes Sealed Rectifier Unit).	14. 172730	Oscillator (Ship's Head Marker) Unit 915
5. 101705	Time Base Unit 514.	15. 62076	Oscillator Unit Design 8 (Ship's Head Marker).
6. 101706	Smoother Unit 516.	16. 101713	Power Supply Unit SGD 101/01.
7. 101718	Heater Transformer Unit 626.	17. 105227	Power Supply Cabinet (One-Unit).
8. 101708	C.R.T. Unit 552	18. 103899	Power Supply Cabinet (Two-Unit).
9. 105222	Video Amplifier Unit 911.	19. 101711	Power Supply Cabinet (Four-Unit).
10. 105223	Brilliance Control Unit 912.	20. 101712	Power Supply Cabinet (Two-Unit, cabinet mounted).
11. 101709	Control Panel (Left).		

NOTES: 1. One only of either item 14 or item 15 is supplied per outfit, depending on type of radar in use. Item 15 will be supplied until stocks are exhausted except where Radar Type 978 is fitted.

RESTRICTED

RESTRICTED

2. Supply of items 17, 18, 19 and 20 depends on number of items 16 fitted for Display Outfits JW and JYB. Single outfit installations have one item 17; installations with two outfits have one item 18; installations having three or four outfits have one item 19; installations with five or six display outfits have one each of items 19 and 20.

PHYSICAL DATA

AP No.	Description	Height	Width	Depth	Weight
103249	Indicator, Plan Position	28 in	50 $\frac{1}{2}$ in	43 in	440 lb
105227	Power Supply Cabinet (One-Unit)	18 in	22 $\frac{5}{8}$ in	24 $\frac{1}{2}$ in	176 lb
103899	Power Supply Cabinet (Two-Unit)	31 $\frac{1}{2}$ in	28 $\frac{3}{4}$ in	26 $\frac{3}{4}$ in	249 lb
101711	Power Supply Cabinet (Four-Unit)	48 $\frac{3}{4}$ in	28 $\frac{3}{4}$ in	26 $\frac{3}{4}$ in	450 lb
101712	Power Supply Cabinet (Two-Unit, cabinet mounted)	19 $\frac{1}{2}$ in	28 $\frac{3}{4}$ in	26 $\frac{3}{4}$ in	226 lb

POWER REQUIREMENTS AND CONSUMPTION

115 V, 220 V, 225-230 V or 440 V \pm 5%, 50-60 Hz. Single Phase 665 W.
120 V, 500 Hz. Aerial Reference Voltage.

HEAT DISSIPATION

Display Outfit : 300 W approximately
Power Supply Unit : 300 W approximately

HANDBOOK

BR 2394

ESTABLISHMENT LIST

E 1060

INSTALLATION SPECIFICATION

B 772

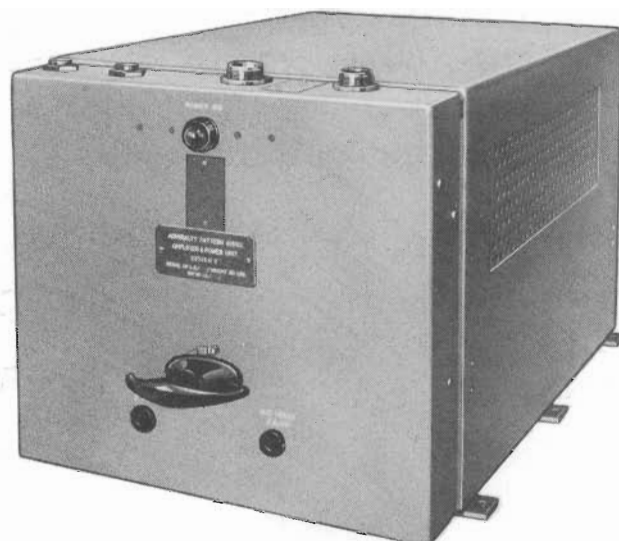
MAINTENANCE SCHEDULE

R5/8

RESTRICTED

RESTRICTEDBR. 333(1)
Original**DISPLAY OUTFIT JZ****JZ****SUMMARY OF DATA**

DISPLAY UNIT 51AE



AMPLIFIER AND POWER UNIT

PURPOSE

An outfit fitted with Type 275/M/P to display fall of shot for accurate ranging.

BRIEF DESCRIPTION

The outfit displays fall of shot on a vertical trace covering a range zone of 2000 yards. Provided the target is accurately strobed for range on Panel L36 the centre of this range zone is at the target. The presentation is in the form of a back-to-back (butterfly) display, errors in bearing appearing as asymmetrical deflection about the vertical trace. An additional i.f. amplifier is incorporated in the Amplifier and Power Unit and employs manual gain control to enable the display to be operated permanently at noise level.

The "Fall of Shot" signal lamp, operated automatically from the fire control equipment, is used to inform the splash spotting operator when a salvo to which a correction has been applied is about to fall.

MAJOR UNITS

Pattern No.	Description	Physical Data			
		Height	Width	Depth	Weight
65031	Display Unit 51AE	11"	1' 2"	2"	50 lb
65030	Amplifier and Power Unit	1' 2"	1' 1"	1'10"	80 lb

POWER REQUIREMENTS AND CONSUMPTION

180 V 500 Hz 250 VA approx.

HEAT DISSIPATION

250 watts approx.

REMARKS

In ships fitted with A.F.C.B. Mk. 10 the Display Unit will be housed in the Application Unit Mk. 1 (D.N.O. equipment) which is part of this equipment. In ships not fitted with A.F.C.B. Mk. 10 the Display Unit will be bulkhead mounted.

The Amplifier and Power Unit will be secured to the modified mount on top of Panel L35 in place of the Type 242 Performance Meter, no longer fitted.

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RESTRICTED

HANDBOOK

BR 1518

ESTABLISHMENT LIST

E 1075

INSTALLATION SPECIFICATION

B 307/R3 Addm. A.

RESTRICTED

RESTRICTED

NOMENCLATURE

- JYA(1) - One Plotting Table with Marker Equipment
- JYA(2) - Two Plotting Tables with Marker Equipment
- JYA(3) - One Plotting Table without Marker Equipment

PHYSICAL DATA

Pattern No.	Description	Height	Width	Depth	Weight
70289	Plotting Table	39½ in	62 in	40 in	1000 lb
70304	Cabinet Design 197, Marker Interlacing	72 in	27 in	24 in	830 lb
70305 }	Rectifier Unit 63D	21 in	18½ in	21 in	230 lb
70306 }	Radar Selector Assembly	44 in	20 in	12 in	170 lb
70307 }	Switch Unit, Design 106, Marker Selection	18 in	20 in	5½ in	40 lb
70281 }	Control Unit Design 124, Tracker Control Assy.	12 in	11 in	14 in	20 lb
70308 }					
70266	Lighting Unit, Ultra Violet	6½ in	9 in	6 in	3 lb
71823	Co-ordinate Converter Cabinet	60 in	27 in	24 in	700 lb

POWER REQUIREMENTS

440 V	60 Hz	2105 W	115 V	400 Hz	185 W	220 V d.c. or 115 V a.c.
115 V	60 Hz	835 W	24 V d.c.		772 W	(for anti-condensation heaters)

HEAT DISSIPATION

Operator's Room	Plotting Table	1.25 kW
	Radar Selector	30 W
	JDA Display	550 W
Annexe	Marker Cabinet	2 kW
	Co-ordinate Converter	1.25 kW
	Power Cabinet	550 W

HANDBOOK

BR 1173

ESTABLISHMENT LIST

E 1222

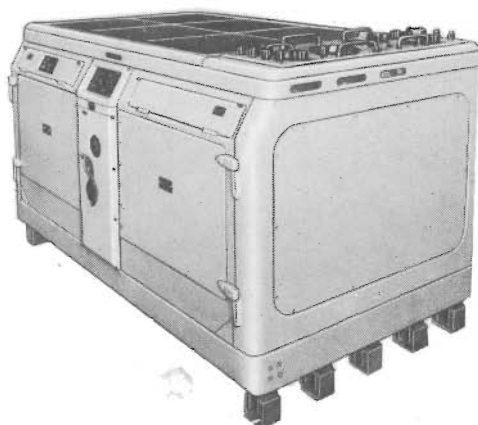
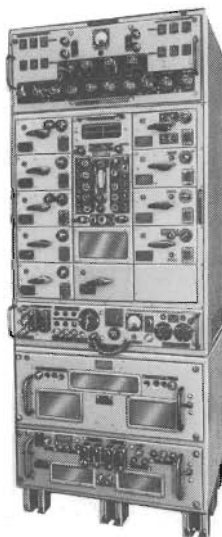
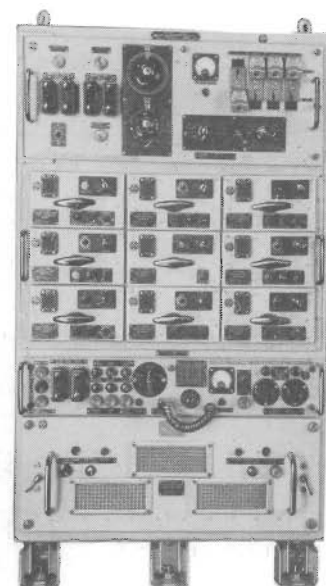
INSTALLATION SPECIFICATION

B 845/PRE3

RESTRICTED

AUTOMATIC SURFACE PLOTTING SYSTEMS JYA(4), (5) AND (6)

SUMMARY OF DATA

PLOTING TABLE
ASSEMBLYMARKER INTERLACING CABINET
ASSEMBLYCO-ORDINATE CONVERTER CABINET
ASSEMBLY

PURPOSE

- JYA(5) To present on three operational displays, two of which are plotting tables, a P.P.I. picture with interlaced bearing and position markers. The picture projected onto the surface of the plotting tables is sea stabilised. Two variations are provided to cater for more limited requirements.
- JYA(4) As JYA(5) but with one plotting table instead of two.
- JYA(6) A display outfit in the form of a plotting table plus a maintenance outfit. It has no marker generating equipment.

BRIEF TECHNICAL DESCRIPTION

The table display is obtained by projection on to a phosphor-coated surface from the face of a $3\frac{1}{2}$ inch c.r.t. The tube and associated optics are mounted on the plotting table carriage assembly. The radar video is fed to the table from one of three radar sets, the selected set also provides the trigger pulse and scanner bearing angle.

Up to six electronic markers showing bearings and positions may be interlaced with the picture, from any one selected radar, one is controlled from the table or the JDA position, three own ship markers are selected from a possible thirteen outstations, two off-set markers are controlled from the table. If JYA(5) is fitted a different radar picture may be selected for each table.

When required, a "spider's web" graticule can be projected on to the plotting surface and the plot used as an ordinary A.R.L. Table.

MAJOR UNITS

- | | | |
|-----|---------------------------|--|
| 1. | AP 70282-5 | Plotting Table Framework |
| 2. | AP 702891 | Cabinet Design 197 Marker Interlacing |
| 3. | AP 70304 | Rectifier Unit 630 DW |
| 4. | AP 172139-40
AP 399088 | Cabinet Servicing |
| 5. | AP 70306 | Base for Switch Unit |
| 6. | AP 70307 | Switch Unit Design 106, Marker Selector |
| 7. | AP 64691 | Cabinet, Design 188, Power |
| 8. | AP 70308 | Mounting for AP 70281 Control Unit Tracker |
| 9. | AP 71823 | Co-ordinate Converter Cabinet |
| 10. | - | Display Outfit JDA3M |

RESTRICTED

Plotting Table Plotting Area 30 in North-South
 45 in East-West

Diameter of Display and Graticule 20 in (Centre restricted to within $5\frac{1}{2}$ in of edge.)

Accuracy Speed ± 0.25 knots below 10 knots
 $\pm 2.5\%$ above 10 knots

 Bearing $\pm \frac{1}{4}^\circ$

 Range $\pm 1\%$ of full scale

PHYSICAL DATA

Pattern No.	Description	Height	Width	Depth	Weight
	Plotting Table Assembly	41 in	62 in	44 in	1000 lb
	Marker Interlacing Cabinet Assembly	76 $\frac{1}{2}$ in	27 in	24 in	930 lb
	Servicing Cabinet Assembly	74 $\frac{1}{2}$ in	34 $\frac{1}{2}$ in	24 $\frac{1}{2}$ in	500 lb
70305 } 70306 } 70307 }	Radar Selector Assembly	44 in	20 in	12 in	170 lb
70281 } 70208 } 70266 }	Switch Unit, Design 106, Marker Selection	18 in	20 in	5 $\frac{1}{2}$ in	40 lb
	Tracker Control Assembly	12 in	11 in	14 in	28 lb
	Lighting, Unit, Ultra Violet	6 $\frac{1}{2}$ in	9 $\frac{1}{2}$ in	6 in	3 lb
	Co-ordinate Converter Cabinet Assembly	57 $\frac{1}{2}$ in	27 in	24 in	700 lb

POWER REQUIREMENTS JYA(5)

440 V 60 Hz 8.4 kW 115 V 400 Hz 300 W 220 V d.c. 115 V/230 V a.c. 1.2 kW
115 V 60 Hz 2.0 kW 24 V d.c. 1 kW (for anti-condensation heaters)

HEAT DISSIPATION

Operations Room Plotting Table 1.25 kW
 Radar Selector 30 W
 JDA Display 550 W

Annexe Marker Cabinet 2 kW
 Co-ordinate Converter 1.25 kW
 Power Cabinet 550 W
 Servicing Cabinet 500 W

HANDBOOK

BR 1173

ESTABLISHMENT LIST

E 1336

INSTALLATION SPECIFICATION

B 915

RESTRICTED

AUTOMATIC SURFACE PLOTTING SYSTEM JYA(7)

JYA(7)

SUMMARY OF DATA

PURPOSE

To present on three operational displays, two of which are plotting tables, a PP1 picture with interlaced bearing and position markers. The picture projected on the plotting table surface is sea stabilised.

BRIEF TECHNICAL DESCRIPTION

Radar data from up to three radar outfits may be displayed. Each of the three display positions has independent choice of the radar to be displayed except when JYA markers are being interlaced with the radar data, then each of the displays showing these markers must show whichever of the three radars has been selected to be processed, at that time, by the Marker Cabinet. Mixed video data, I.F.F. Sonar Markers etc. may be displayed with their associated radar independently at each display, when required, with the same restriction as above when JYA Markers are to be displayed.

Six JYA Markers may be displayed at the same time on each or either of the plotting tables. Five of these may be in the form of either a Bearing or a Position Marker, the other is Position only. The latter marker only is shown on the third display. Selection of Marker sources for four of the JYA Markers is carried out externally to the system at a Data Selection Panel mounted over one of the plotting tables. These sources may be range and/or bearing transmissions from other displays, sonar outputs, visual sights etc. Two of the markers, not selected via the Data Selection Panel, may be offset to show bearing lines from points other than the display centre. The plotting table picture is projected onto a phosphor sheet on the underside of the plotting surface. The projection unit, which also projects a range and bearing graticule, is mounted on a carriage, in the base of the table, which moves under the control of ship's speed and course data.

MAJOR UNITS

(1) Plotting Table Assembly	Two in number
(2) Marker Cabinet Assembly	One in number
(3) Co-ordinate Converter Assembly	One in number
(4) Servicing Cabinet Assembly	One in number
(5) Power Units	Three in number
(6) Display Outfits JDA3M	Two in number
Plotting Table Data	
Plotting Area	30 in North-South 45 in East-West
Display Diameter	20 in
Display centre movement	To within $5\frac{1}{2}$ in of the edge of the Plotting surface
Scales	$\frac{1}{4}$ mile per inch Total range 5000 yds $\frac{1}{2}$ mile per inch Total range 10 000 yds 1 mile per inch Total range 20 000 yds 2 miles per inch Total range 40 000 yds 5 miles per inch Total range 50 miles
Accuracy	Radar Range 1% of full range Bearing $\pm 4^{\circ}$ Marker Range $\pm 3\%$ of full range Bearing $\pm 4^{\circ}$ Table Movement Speed ± 0.25 knots below 10 $\pm 2.5\%$ above 10 knots Bearing $\pm \frac{1}{2}^{\circ}$

PHYSICAL DATA

Pattern No.	Description	Height	Width	Depth	Weight
-	Plotting Table Assembly	41 in	62 in	44 in	1000 lb
-	Marker Cabinet Assembly	76 $\frac{1}{2}$ in	27 in	24 in	930 lb
-	Co-ordinate Converter Assembly	57 $\frac{1}{2}$ in	27 in	24 in	700 lb
-	Servicing Cabinet Assembly	74 $\frac{1}{2}$ in	34 $\frac{1}{2}$ in	24 $\frac{1}{2}$ in	500 lb
AP 173415	Selector Unit Relay	18 in	12 in	8 $\frac{1}{2}$ in	10 lb
972-5302	Switch Unit Control Selector	6 x 6 in	VCS		4 lb
-	Power Cabinet Assembly	21 $\frac{1}{2}$ in	18 $\frac{1}{2}$ in	19 $\frac{1}{2}$ in	254 lb
AP 173416	Distribution Unit Radar and Marker	14 $\frac{1}{2}$ in	12 in	6 $\frac{1}{2}$ in	8 lb
-	Tracker Control Assembly	12 in	10 $\frac{1}{2}$ in	14 in	28 lb

(Illustrations as before)

RESTRICTED

POWER REQUIREMENTS

440 V 60 Hz 8 kW 115 V 400 Hz 0.2 kW
115 V 60 Hz 2 kW 24 V d.c. 0.8 kW
220 V d.c. or 115 V a.c. (for anti-condensation heaters) 1.3 kW

HEAT DISSIPATION

Operations Room	Plotting Tables	1.25 kW each
	JDA Display	0.5 kW
	Ancillaries	0.5 kW
Annexe	Marker Cabinet	2 kW
	Co-ordinate	
	Converter	1.25 kW
	Power Units	0.5 kW each
	Servicing Cabinet	0.5 kW
	Monitor Display	0.5 kW

HANDBOOK

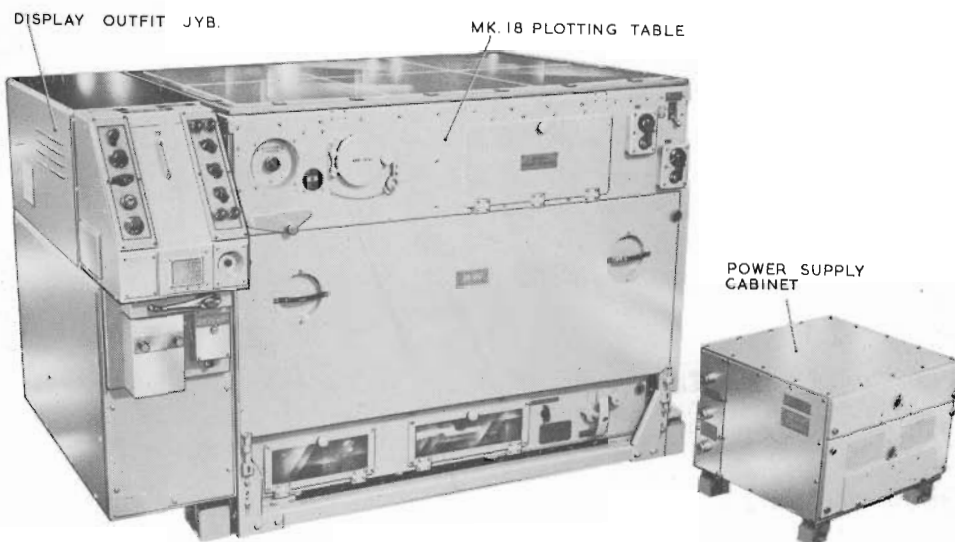
BR 1173

ESTABLISHMENT LIST

E 1336

INSTALLATION SPECIFICATION

B 1025

RESTRICTEDBR 333(1)
Original**DISPLAY OUTFIT JYB****JYB****SUMMARY OF DATA****DISPLAY OUTFIT JYB WITH POWER SUPPLY CABINET****PURPOSE**

Display Outfit JYB is designed to operate in conjunction with the A.R.L. Mk. 18 plotting table, projecting a P.P.I. display on to the plotting table surface. The plotting mechanism moves the P.P.I., producing a true motion display.

BRIEF DESCRIPTION

Display Outfit JYB comprises a projection type P.P.I. and a separate power pack supplying the various power requirements. Range scales available are: 5, 10, 20 and 50 nautical miles with provision for selecting either of two radar inputs to be displayed. Signals are displayed as high intensity echoes on a c.r.t. screen approximately two inches in diameter and magnified by an optical system to a diameter of approximately 20 inches. The image is projected on to the plotting table surface on which is fitted a fluorescent layer.

MAJOR UNITS

	AP No.	Description
1.	105228	Cabinet Control Assembly (Includes Units 11 and 12)
2.	101701	Calibrator (Range Marker) Unit 503
3.	101702	Servo Amplifier Unit 504
4.	101705	Time Base Unit 514
5.	101706	Smoothing Unit 516
6.	105223	Brilliance Control Unit 912
7.	105222	Video Amplifier Unit 911
8.	172730	Oscillator (Ship's Head Line Marker) Unit 915
9.	172649	Signal Data Converter (Log-Lin) Unit 916
10.	105224	Heater Transformer Unit 920
11.	105225	Right Hand Control Panel 913
12.	105226	Left Hand Control Panel 914
13.	105229	Optical Mounting Framework Assembly
14.	105221	C.R.T. Unit 910 (Includes Unit 16)
15.	101703	25 kV E.H.T. Unit 508 (Includes AP 101726 Sealed Rectifier Unit)
16.	101717	Deflection Coil Assembly
17.	105227	Power Supply Cabinet SGE 110/20
18.	101713	Power Supply Unit SGD 101/01

PHYSICAL DATA

Pattern No.	Description	Height	Width	Depth	Weight
AP 105228 and Mk. 18 plotting table	Plotting Table with JYB equipment	39 $\frac{3}{4}$ in	63 $\frac{3}{4}$ in	41 $\frac{1}{2}$ in	870 lb
AP 105227	Power Supply Cabinet	18 in	22 $\frac{1}{16}$ in	24 $\frac{1}{2}$ in	176 lb

RESTRICTED

RESTRICTED

POWER REQUIREMENTS AND CONSUMPTION

115 V or 230 V \pm 5% 50-60 Hz Single Phase 665 W
120 V, 500 Hz Aerial reference voltage.

HEAT DISSIPATION

Display Unit 300 W approximately
Power Supply Unit 300 W approximately

HANDBOOKS

BR 2359 Display Outfit JYB
BR 268(2) Plotting Table ARL

ESTABLISHMENT LIST

E 1348

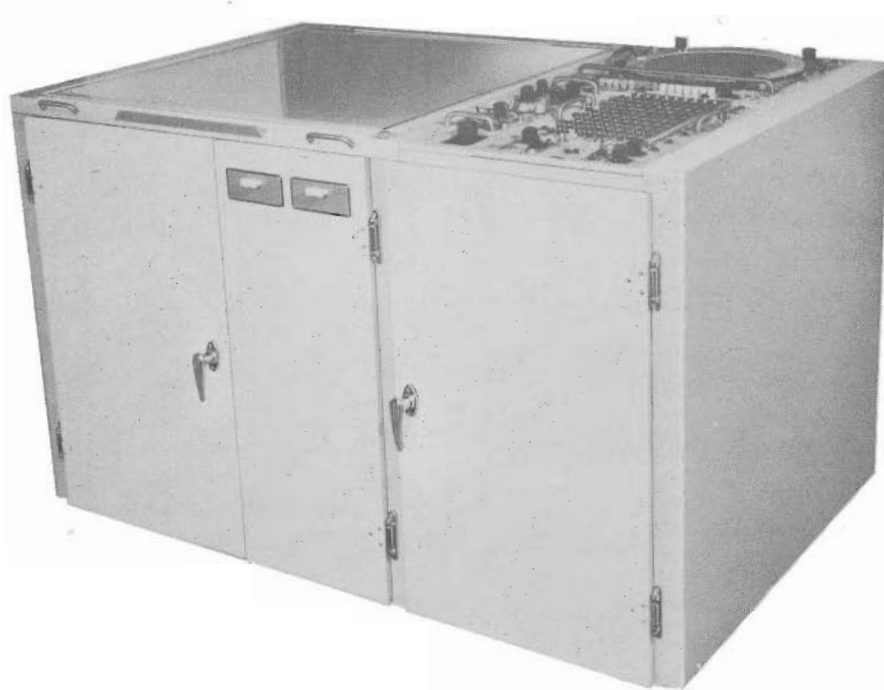
INSTALLATION SPECIFICATION

B 903

MAINTENANCE SCHEDULE

R6/4

RESTRICTED

RESTRICTEDBR 333(1)
Original**AUTOMATIC SURFACE PLOTTING SYSTEM JYC****JYC****SUMMARY OF DATA****PURPOSE**

Automatic Surface Plotting System JYC (Tactical Plot) provides a Plotting Screen on which is displayed a plan position picture, produced by data processing equipment from radar returns. Facilities are provided for tote display and manual injection to the computer. Provision is also made for displaying raw radar.

BRIEF DESCRIPTION

Automatic Surface Plotting System JYC consists of two displays and a Manual Injection Unit and can be considered in two sections. One section (Indicator Plot) provides a 32 inch diameter Plotting Screen. The other section consists of a 12 inch Display Unit and a manual Injection Unit. The Indicator Plot is equipment that produces a plan position cathode ray tube display, photographs the display on to 16 mm film and processes and projects the filmed image, within a few seconds, on to the Plotting Screen.

MAJOR UNITS

- 5840-AP 172881 Indicator, Digital Display:
 - 5840-AP 172882 Amplifier, Video and Deflection
 - 5840-AP 172883 Amplifier, Gating and Deflection
 - 5840-AP 172314 Power Supply E.H.T.
 - 5840-AP 172884 Selector, Height and Category
 - 5840-AP 172885 Coil Assembly, Deflection and Focusing
 - CV 429 Cathode Ray Tube (12 inch diameter)
- 5840-AP 172309 Data Input Unit, Manual:
 - 5840-AP 172306 Joystick Unit, Display
 - 5840-AP 172307 Power Supply
 - 5840-AP 172315 Selector, Tote and Pointer
 - 5840-AP 172316 Data Input, Sub-Assembly
 - 5930-AP 206617 Switch, Push Button, 10-way (eleven off)
- 5840-AP 199169 Distribution Box
 - Indicator Plot. consisting of:-
 - 5840-AP 173171 Mainplate
 - 5840-AP 172882 Amplifier, Video and Deflection
 - 5840-AP 172883 Amplifier, Gating and Deflection
 - 5840-AP 172314 Power Supply E.H.T.
 - 5840-AP 173172 Control, Display
 - 5940-AP 173174 Power Supply
 - 5840-AP 162447 Fume Disposal Unit
 - 6760-AP 162445 Tank Assembly, Processing
 - 5840-AP 173176 Screen, Plotting
 - 5840-AP 173173 Panel, Control
 - 6760-AP 162446 Tank, Chemical Waste
 - 5840-AP 173182 Grid Unit
 - 5960-AP 161008 Shield, Electronic Valve
 - AP 162448 Mirror Assembly

RESTRICTED

RESTRICTED

4310-99-972-0637
Compressor, Reciprocating
4140-99-971-7791
Blowers
Heater, Anti-Condensation
Cathode Ray Tube (3 inch diameter)
5840-AP 172885 Coil Assembly, Deflection and Focussing

PHYSICAL DATA

	Height	Width	Depth	Weight
Plotting System JYC	3 ft 2 in	5 ft	3 ft 7 in	1150 lb

POWER REQUIREMENTS AND CONSUMPTION

115 V \pm 5% 50-60 Hz single phase 300 W - A.C.H. heaters or alternatively
230 V d.c. 300 W - A.C.H. heaters
440 V 60 Hz 3Ø 800 W - Indicator Plot Supplies
200 V 400 Hz 3Ø 700 W - Radar Requirements
50 V d.c. 50 W - Radar Contactor
50 V d.c. 50 W - Radar Illumination

HEAT DISSIPATION

1600 W

HANDBOOKS

BR 2403
BR 2402 (JGA Handbook for additional information regarding the Indicator, Digital Display, and Data Input Unit, Manual).

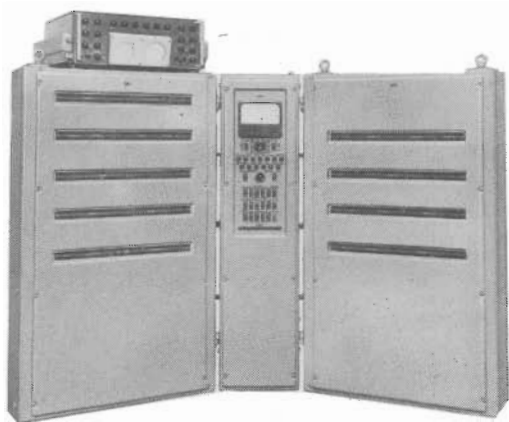
ESTABLISHMENT LIST

E 1371

INSTALLATION SPECIFICATION

B960 Volume 5

RESTRICTED

RESTRICTEDBR 333(1)
Original**OUTFITS RJT(1) AND RJR(1)****RJT(1)**
RJR(1)**SUMMARY OF DATA**

Outfit RJR/1 Receiver



Outfit RJT/1 Transmitter

PURPOSE

Transmission and reception between ships of radar plotting information in the form which can be displayed by the Comprehensive Display System.

TYPE OF TRANSMISSION

Pulse code modulation of conventional narrow band HF or UHF voice channel.

BRIEF DESCRIPTION

The C.D.S. information to be transmitted consists of plan position co-ordinates in cartesian form of up to 48 Tracks, together with ancillary information comprising Track Reference No., Height to the nearest 100 ft, category and size for each target. In addition the cartesian co-ordinates of two marker pointers are included in order to assist in passing instructions etc. The co-ordinate information is stored by C.D.S. in voltage analogue form, each voltage having a value between -100 V and +100 V. The ancillary information is stored in the form of code voltages, having values which are integral multiples of 10 V between +10 V and +100 V representing in numerical order the digits 0 to 9 together with additional voltages of -30 V and -40 V which are instructional and indicate Vacant Store and Cancel Store. The stores are scanned by the C.D.S. marker switches at a rate such that the whole of the information is presented every 24 seconds. This sequence of voltage analogues is passed to Outfit RJT(1) which encodes it in binary form suitable for transmission over a conventional HF or UHF voice channel. At the receiving end, the signals are decoded by Outfit RJR(1) and the voltage analogues synthesised so that the original information can be displayed on a local C.D.S.

In the encoder (RJT(1)) the co-ordinate information for the tracks and pointers is fed into a high accuracy input and the ancillary information into a low accuracy input. The function of the input circuits is to serialise the information so that each item may be encoded in turn. These circuits are followed by high and low accuracy time-base circuits respectively in which the voltage analogues are converted to time analogues. The time analogues are translated into digital form after which the high and low accuracy outputs are combined in a mixer stage prior to the output stage. At this point the digital signal modulates a 1600 Hz sub-carrier which is then passed via the KH control system to the radio transmitter. The basic waveforms from which are derived the pulses for controlling the coding operations are generated by a main counter circuit. This is a crystal-controlled oscillator followed by a series of dividing stages and is synchronised to the C.D.S. marker switches.

In the decoder (RJR(1)) the sequence of operations is similar but in reverse order. Throughout both outfits, there are voltage error correction circuits and monitoring facilities. Apart from power supplies and monitoring, the equipment involves large numbers of identical circuits which are constructed as plug-in units. These units are mounted in water-cooled racks; one rack is required for the transmitter and two for the receiver. A Heat Exchange Cabinet, Des. 85 may be fitted if required.

RESTRICTED

RESTRICTED

MAJOR UNITS

Item	Pattern No.	Description	Quantity	
			RJT(1)	RJR(1)
1	AP 64912	Rack Assembly, Des. 15 L.H.		1
2	AP 64913	Rack Assembly, Des. 16 R.H.		1
3	AP 64914	Rack Assembly, Des. 17	1	
4	AP 71167	Power-supply Drawer, Des. 9	1	1
5	AP 71168	Power-supply Drawer, Des. 10	1	1
6	AP 63992	Monitor Unit Des. 24	1	1
7	AP 64915	Monitor Control Panel		1
8	AP 64916	Monitor Control Panel Des. 2	1	
9	AP 63283	Cabinet Assembly, Des. 85 (Cooling)	1	1
10	AP 71169	Cabinet, Des. 218, Power-supply	1	1
11	AP 70246	Dummy Load	1	1
12	AP 63205	Binary Counter Unit	54	65
13	AP 63206	Gating Amplifier Unit, Positive	23	58
14	AP 63207	Gating Amplifier Unit, Negative	8	28
15	AP 63284	Input Unit, Amplifier	-	1
16	AP 64001	Store Unit	-	34
17	AP 63285	Input Unit, Bias Control	-	1
18	AP 63286	Diode Gate Unit	-	13
19	AP 63287	Amplifier and Diode Switch Unit	3	15
20	AP 63288	Time-base Unit, 72P	-	2
21	AP 63289	Time-base Correction Store Unit	4	8
22	AP 63290	Time-base Unit 72R	2	-
23	AP 64382	Constant-current Unit	2	-
24	AP 63998	Output Unit, Des. 6	12	9
25	AP 63995	Frequency-doubler Unit	-	1
26	AP 63996	Crystal Oscillator Unit	1	1
27	AP 64384	Amplifier Unit, Des. 28	7	7
28	AP 63218A	Relay Unit, Des. 77	10	52
29	AP 63999	Output Unit, Des. 7	1	-
30	AP 65043	Rectifier Unit 63DY	1	1

NOTE: Items 12-29 inc. are plug-in units contained in Items 1, 2 and 3.

PHYSICAL DATA

	Height	Width	Depth
Equipment Racks	5 ft 3 in	2 ft 10½ in	1 ft 1½ in
Monitor Unit	1 ft 10 in	1 ft 9½ in	10½ in
Monitor Control Panel	5 ft 3 in	1 ft 2½ in	1 ft 1½ in
Power Supply Cabinet	5 ft 10 in	2 ft 4 in	1 ft 2½ in
Heat Exchanger	3 ft 9 in	1 ft 3 in	1 ft 4 in

POWER SUPPLIES

Outfit RJT(1) : 115 V 60 Hz 1Ø 0.6A (or 200/220 V d.c.)
 440 V 60 Hz 3Ø 3-wire Total Currents Red 4.2A, Blue 4.0A.

Outfit RJR(1) : 115 V 60 Hz 1Ø 1.05A (or 200/220 V d.c.)
 440 V 60 Hz 3Ø 3-wire Total Currents Red 6.5A, Yellow 6.4A, Blue 5.5A

HANDBOOK

BR 2213(1), (2), (3)A, (3)B.

ESTABLISHMENT LIST

E1132

RESTRICTED

RESTRICTEDBR 333(1)
Original**TRUE MOTION OUTFIT QAB****QAB****SUMMARY OF DATA****PURPOSE**

To produce data for a true motion presentation of ships movement on Display Outfit JUC(4).

BRIEF DESCRIPTION

The Computer, True Motion, in Outfit QAB, provides outputs to move the origin of the trace on the C.R.T. in display Outfit JUC(4) to correspond with ships course and speed. It includes facilities for the manual injection of tide motion data. The computer can also be used for manual external off centring of the origin of the trace on the C.R.T. Facilities are included in the Outfit QAB for testing the Computer, True Motion.

MAJOR UNITS

NSN 5840-99-521-2215 Computer, True Motion
NSN 5840-99-972-4561 Test Set, True Motion
NSN 5840-99-522-4299 Cable Assembly

PHYSICAL DATA

Height 9 inches Width 13 inches Length 20 inches Weight 59 lbs

POWER REQUIREMENTS

180 V 1100 Hz 75 watts from Display Outfit JUC(4).

HANDBOOK

BR 4142.

ESTABLISHMENT LIST

S1604

INSTALLATION SPECIFICATION

B913/R1

RESTRICTED

TEACHER OUTFIT HRL(1)

HRL(1)

SUMMARY OF DATA

PURPOSE

To provide target acquisition training and practice for the operator of gun direction and fire control radar equipments of the following types and combinations.

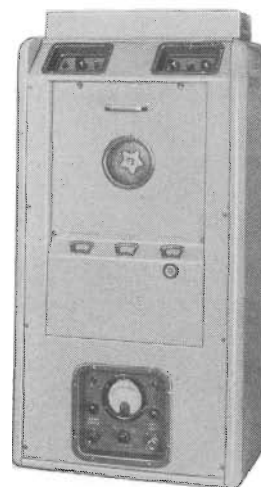
F.C. Radar Type 275M/P - G.D. Radar Type 293P/Q
F.C. Radar Type 903 - G.D. Radar Type 992
F.C. Radar Type 903 - G.D. Radar Type 293P/Q

BRIEF DESCRIPTION

The Target Cam Assembly has three component cams, contoured to represent the variations in target range, bearing and elevation. The cam assembly is rotated by a drive motor unit and motions are picked off from the cams and imparted to magslips and potentiometers in the teacher.

The magslips in the teacher are linked with magslip transmissions from the radar equipments, thus producing output signals which represent the angular misalignments between the radar aerials and the teacher target; these signals are used to control the amplitude of the artificial aircraft echo pulses produced by the teacher pulse circuits.

The radar equipments feed sync pulses to the teacher pulse circuits which then generate delayed pulses to be fed back to the radar equipments. The amount of delay which represents the range of the target, is controlled by potentiometers driven by the range cam in the teacher. Subsidiary control signals from the radar equipments are fed into the teacher to simulate special characteristics of radar operation.



TEACHER OUTFIT HRL(1)

MAJOR UNITS

Part. No.	Description	Physical Data			
		Height	Width	Depth	Weight
62290	Cabinet Design 128, Unit A (with shock mounting)	43½ in 49 in	21½ in 21½ in	13½ in 13½ in	94½ lb -
62291	Target Course Generator, Unit B	-	-	-	80 lb (includes chassis)
62292	Pulse Unit, Unit D	-	-	-	15 lb
62293	Target Data Unit, Unit F	-	-	-	20 lb
62294	Rectifier Unit, 63BZ Unit G	-	-	-	70 lb
63465	Motor Drive Assembly, Unit C	-	-	-	19 lb

NOTE: AP 62291 includes one each of AP 62293 and AP 63465.

POWER REQUIREMENTS

115 V or 230 V, 50/60 Hz, single phase a.c.
350 W average consumption, 400 W maximum.

TARGET CAM ASSEMBLIES

AP No.	Description
62295	Cam Assembly No. 1 Special alignment Cam for setting up and testing.
62296	Cam Assembly No. 2 Level bombing attack on consort.
62297	Cam Assembly No. 3 Dive bombing attack on own ship
62298	Cam Assembly No. 4 Evasive dive attack on own ship.
62299	Cam Assembly No. 5 Low approach to own ship with climb and dive attack.

NOTE: The carrying case for AP 62295 has provision for the stowage of a flexible test cable AP 63467.

RESTRICTED

HANDBOOK

BR 204,1)

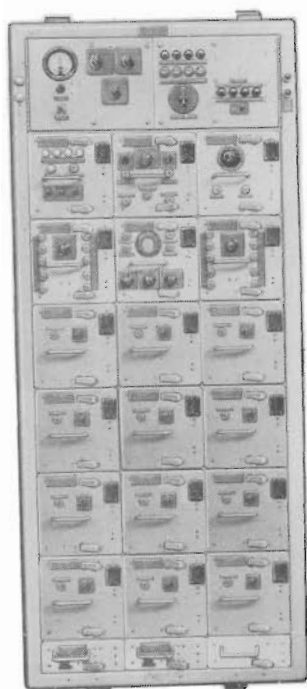
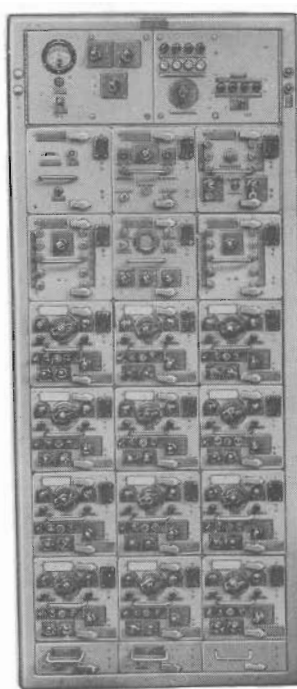
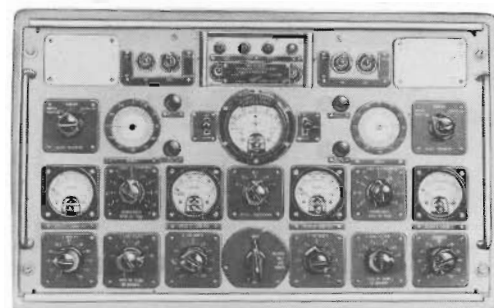
ESTABLISHMENT LIST

E 1118

INSTALLATION SPECIFICATION

B808

RESTRICTED

RESTRICTEDBR 333(1)
Original**TEACHER OUTFIT HRN****HRN****SUMMARY OF DATA****CABINET MK****CABINET ML****CABINET MK1-6****PURPOSE**

To provide training facilities for the Comprehensive Display System and radar Type 963.

BRIEF DESCRIPTION

The equipment consists of two cabinets containing the echo generating circuits, and six control panels which are fitted remote from the cabinets, normally in the A.D.R. or R.D.R. A changeover and distribution box, fitted adjacent to the cabinets in the M.D.R. provides for switching the Outfit into the C.D.S. distribution system.

The equipment provides 24 synthetic targets, 12 being fully steerable and controlled from the six control panels, the remainder (semi-steerable) being set up and controlled locally at the cabinets. The targets can be initially positioned anywhere within a range of 250 miles. Speed is controllable on any course up to a maximum of 1000 knots and height up to 50 000 feet. A simple form of I.F.F. indication can be switched on if desired and facilities are available for grouping the targets in formation under the control of a selected leader. The C.D.S. analysis displays are presented with synthetic height information on the targets, one at a time, in the lower three main beams.

A switch is provided which gives the following facilities:

- (a) Live 984 + Synthetic
- (b) Radar Recorder + Synthetic
- (c) Synthetic only
- (d) C.C.A.

In the C.C.A. position, half the available echo generators, the semi-steerables, are used to feed the Type 963 displays; the fully steerable fully steerable feeding C.D.S., the echoes on both System displays being controlled by the fully steerable.

MAJOR UNITS

AP No.	Description	Qty.	Physical Data			
			Height in	Depth in	Width in	Weight lb
Cabinet MK	64750 Cabinet, design 135, trainer	1	63	24	27	390
	64755 Pulse Generator, design 3, rate of turn	1	8	24	8	17
	64756 Mixer Unit, design 20	1	8	24	8	16
	70105 Wind-simulator unit	1	8	24	8	8
	64753 Height simulator unit, analyser	2	8	24	8	21
	64754 Monitor and setting-up unit	1	8	24	8	21
	64751 Aircraft simulator, fully steerable	12	8	24	8	20
	64757 Cathode follower unit 73T, high accuracy	2	3	24	8	8

RESTRICTED

RESTRICTED

AP No.	Description	Qty.	Physical Data			
			Height in	Depth in	Width in	Weight lb
Cabinet ML	64750 Cabinet, design 135, trainer	1	63	24	27	390
	62847 Pulse-generator unit, motor-driven	1	8	24	8	21
	64756 Mixer unit, design 20	1	8	24	8	16
	64758 Saw-tooth generator unit, design 3	1	8	24	8	18
	64753 Height simulator unit, analyser	2	8	24	8	21
	64754 Monitor and setting-up unit	1	8	24	8	21
	64752 Aircraft simulator, semi-steerable	12	8	24	8	23
	64757 Cathode follower unit 73T, high accuracy	2	3	24	8	8
Cabinet MQ	64769 Distribution box and change-over	1	63	7½	24	198
Cabinets MK1-6	71008 Cabinet design 212	6	12½	14½	20	30
	64759 Simulator control unit, fully steerable	6	11	12¾	19	40

POWER REQUIREMENTS

500 V d.c. +ve 700 mA
 300 V d.c. +ve 1.5A
 300 V d.c. -ve 1.2A
 200 V 400 Hz 8.4A
 50 V d.c. 16.3A
 115 V 60 Hz 200 W

The above supplies are derived from the C.D.S.

HANDBOOK

BR 2310

ESTABLISHMENT LIST

E 1142

INSTALLATION SPECIFICATION

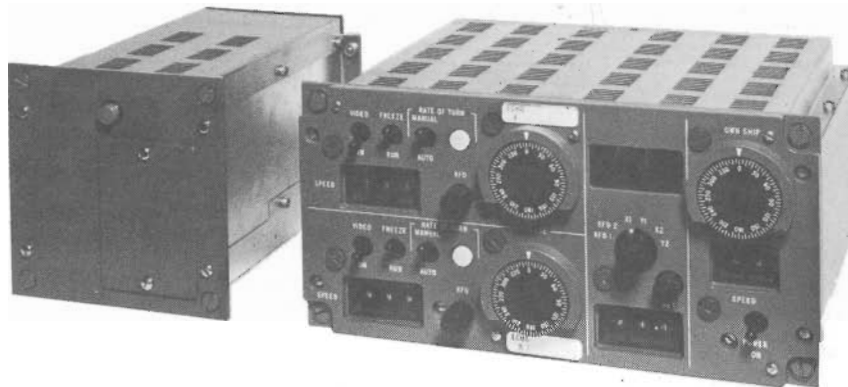
B829

RESTRICTED

RADAR TEACHER OUTFIT HRT

HRT

SUMMARY OF DATA

RADAR TEACHER OUTFIT
HRT(2)

PURPOSE

To generate two radar echoes, simulating ships, fixed-wing aircraft or helicopters, in order to provide continuation training at sea. The outfit operates in conjunction with the Type 978 or 1006 radar equipment from which it obtains its synchronisation and aerial rotation signals.

BRIEF DESCRIPTION

The particular outfit, HRT(1) or HRT(2), installed in a ship is determined by the type of aerial rotation signals available. Where these are at 4096 pulses/rev the outfit consists solely of a radar echo generator and is designated HRT(1). When the aerial rotation information is provided by a synchro at 400 Hz, an additional unit, a data retransmission unit, is required to convert the synchro signals to 4096 pulses/rev. In this case the outfit nomenclature is HRT(2).

The two simulated echoes produced by the echo generator are individually controllable in speed and direction, their position being continuously computed relative to the own ship which is permanently stationed at the centre of the 80 data miles square playing area. Provided they are within radar range the synthetic echoes have a fixed intensity equal to the peak amplitude of the live echoes picked up by the Type 978 or 1006 radar equipment. To add realism to the simulation the range of detection of the synthetic echoes can be set to any value up to a maximum of 40 data miles. A changeover relay ensures that the live video output from the radar equipment is passed to the radar display when the radar teacher outfit is not operating. When the radar teacher outfit is not fitted, a shorting socket maintains the links between the radar equipment and its associated display system.

MAJOR UNITS

		Height	Width	Depth	Weight
6940-99-523-7171	Generator Radar Echo	6 in	12 in	9 in	20 lb
6940-99-525-3386	Data Retransmission Unit	6 in	6 in	9 in	15 lb
5935-99-525-7475	Dummy Electrical Socket				

The two main units are designed to fit into the following VCS boxes:

VCS 331 - Generator radar echo
VCS 336 - Data retransmission unit

PERFORMANCE CHARACTERISTICS

Inputs

- (1) Sync - 5 V to 30 V positive.
- (2) Video - 0 V to 10 V positive into 68 ohms.
- (3) Aerial rotation - three wire synchro or mag slip, 400 Hz 90 V line/line into the data retransmission unit or 4096 pulses and North marker pulse into the radar echo generator.

RESTRICTED

(4) Power Supplies

HRT(1) - 115 V \pm 5%, 400 Hz, 24 VA and 22 V \pm 4 V d.c. 14 VA.
HRT(2) - 115 V \pm 5%, 400 Hz, 36 VA and 22 V \pm 4 V d.c. 15 VA.

In Outfit HRT(2) the data retransmission unit obtains its supplies from the echo generator.

Output

Live radar video combined with video generated within the teacher. This composite video has similar characteristics to the input video.

Echo Characteristics

- (1) Number of echoes - two
- (2) Echo size - 1.0⁰ wide nominal over the range 0.5 to 40 miles
- (3) Pulse length - approximately 50 yards (300 ns)
- (4) Computed position - updated in approximately 15 yard increments
- (5) Minimum usable range - less than 500 yards
- (6) Maximum usable range - 40 data miles (one data mile = 2000 yards)
- (7) Speed - 0 to 999 knots
- (8) Course - 0 to 360⁰
- (9) Automatic rate of turn - 3⁰/sec (nominal)
- (10) Range of first detection (RFD) - 0-40 miles
- (11) Fade characteristic - \pm 0.5 mile of RFD set in.

Own Ship Characteristics

- (1) Speed - 0 to 99 knots
- (2) Course - 0 to 360⁰
- (3) Position in playing area - permanently stationed in centre.

HANDBOOK

Radar Teacher Outfit HRT. BR 4238.

INSTALLATION SPECIFICATION

Radar Teacher Outfit HRT. B 1252.

ESTABLISHMENT LIST

Radar Teacher Outfit HRT. S 1690.

RESTRICTED

RESTRICTEDBR 333(1)
Original**BEARING RESOLVER OUTFIT PAB****PAB****SUMMARY OF DATA****PURPOSE**

To receive magslip bearing information from a radar aerial and convert this information into a two phase signal suitable for feeding to remote fixed-coil P.P.I. displays.

BRIEF DESCRIPTION

A 400 Hz magslip link is used for transmission from the radar aerial to the Bearing Resolver Outfit and the output from the latter is in the form $A \sin \theta$ and $A \cos \theta$ where θ is the angle between the aerial and a fixed datum line (either true north or ships head) and A is a constant which in this equipment is 80 volts. There is a common earth return for both phases. Normally, up to 15 display outfits of the JDA series or any number of display units with a total load impedance of not less than 13 000 ohms may be fed from one Bearing Resolver Outfit.

Early production cabinets have been modified to include a third grille, later cabinets have two grilles, as indicated in lower illustration.

MAJOR UNIT

Pattern 64694 Cabinet, Design 189, Bearing Resolver
The following chassis are contained in the Cabinet:-

Pattern 64713 Phase Sensitive Rectifier Chassis, Design 5
(2 in Number)

Pattern 64714 Oscillator Chassis, Design 11

Pattern 64715 Voltage Regulator Chassis, Design 4

Pattern 64716 Power and Resolver Chassis.

PHYSICAL DATA

Bearing Resolver Cabinet (containing chassis) -

Height	Width	Depth	Weight
27½ in	18½ in	15½ in	200 lb

POWER REQUIREMENTS AND CONSUMPTION

Main input	115 V	50-60 Hz	1φ	4.5 A
	or 230 V	50-60 Hz	1φ	2.25 A
	or 440 V	50-60 Hz	1φ	1.175 A
	or 200 V	400 Hz	1φ	2.58 A

Fan Supply	115 V	50-60 Hz	1φ	0.64 A
	or 230 V	50-60 Hz	1φ	0.32 A

Anti-condensation Heaters

115 V	50-60 Hz	1φ	0.35 A
or 230 V	50-60 Hz	1φ	0.35 A
or 115/230 V d.c.			

HEAT DISSIPATION

600 W

HAND BOOK

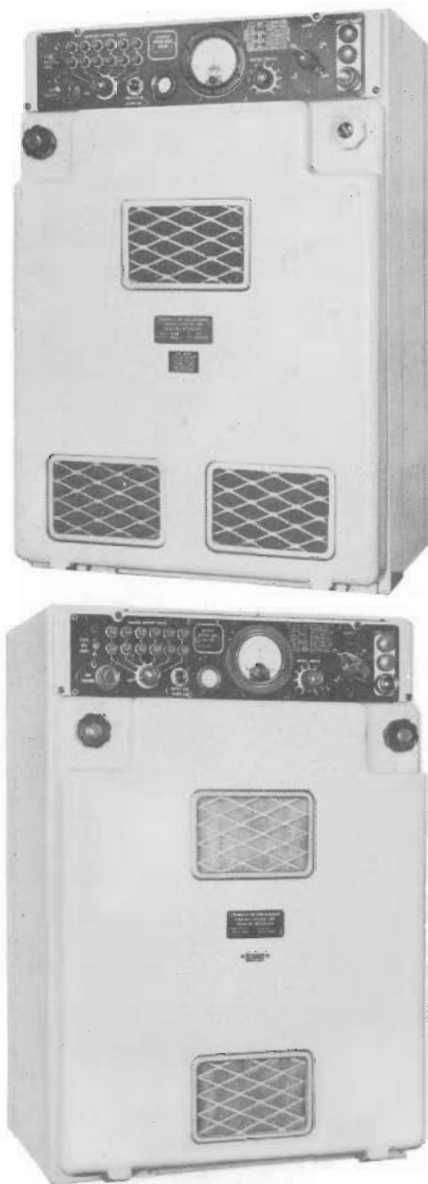
BR 1146(1)(2)

ESTABLISHMENT LIST

E.1160

INSTALLATION SPECIFICATION

B.860

**RESTRICTED**

RADAR DATA DISTRIBUTION OUTFIT PFA SERIES

PFA

SUMMARY OF DATA

PURPOSE

To process and distribute video from most Warning and Navigation Radars at pre-set noise levels and to distribute synchronising signals, ships head marker and aerial rotation information to a maximum of 24 P.P.I. displays.

BRIEF DESCRIPTION

Outfit PFA is a system for processing and distributing video at pre-set noise levels and for distributing synchronising signals, ships head marker and aerial rotation information to a maximum of 24 displays. It may be used with almost all navigation and warning radars and it will process linear video inputs or logarithmic video inputs of 20 or 40-60 dB/volt. The Outfit has input selection for radar or Teacher Outfit REJ. For the general principles of video signals and Synchronisation Pulses in Warning and Navigation Radar Sets see BR 1989.

MAJOR UNIT

5840-AP 172721 Distribution Unit, Video

The following are contained in the Unit:

5840-AP 172722	Video Processing Unit
5840-AP 172724	Drawer Emitter Follower
5840-AP 172727	Module, Double Emitter Follower (fitted in Emitter Follower Drawer)
5840-AP 172723	Meter Unit, Noise Level
6130-AP 204002	Power Supply Unit

AUXILIARY UNITS

5840-AP 173162	Radar Selector Switch Unit
6110-99-972-3160	Distribution Box, R.F. (for S.H.M.)
6110-99-972-3159	Distribution Box, Sync
6110-99-972-3475	Distribution Box, 8-way
	and/or
6110-99-972-3476	Distribution Box, 12-way
5840-AP 173401	Mixer, Electronic Marker

PHYSICAL DATA

	Height	Width	Depth	Weight
Distribution Unit, Video	34½ in	16 in	17 in	120 lb
Radar Selector Switch Unit				
Distribution Box, Sync	2½ in	7 in	6 in	
Distribution Box, R.F.				
Distribution Box, 8-way				
Distribution Box, 12-way				
Mixer Electronic Marker	6 in	6 in	6 in	

POWER REQUIREMENTS

Main Input	115 V, 60 Hz, 1 ph, 98 VA
Anti-Condensation Heater	115 V, 60 Hz, 1 ph, 40 VA

ASSOCIATED EQUIPMENTS (not part of Outfit PFA)

Pattern 5840-AP 173096 Ship Head Marker Generator (BR 2306)
Outfit TRA Data Retransmission Outfit (BR 2367)
Outfit PAB Bearing Resolver Outfit (BR 1146)

HANDBOOK

BR 2436

ESTABLISHMENT LIST

E 1426

RESTRICTED

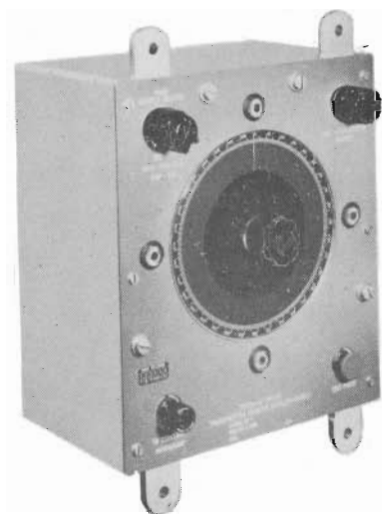
INSTALLATION SPECIFICATION

B 923 Radar Data Distribution System including Outfits PFA series.

Care must be taken to consult the Installation Specifications for associated equipments including JYA, MDA/H, RRA, Mk.10 I.F.F. where appropriate.

B 907 Ship's Head Marker Equipment
B 922 Data Transmission Outfit TRA
B 860 Bearing Resolver Outfit PAB
B 857 Radar Recording Outfit REJ
B 927 Transponder Reply Receiver Outfit RRA
B 925 Electronic Marker Outfit MDA-H
B 915 Automatic Surface Plotting Outfit JYA
B 831 944(1), 944M(1))
B 833 944(2), 944M(2)) MK.10 I.F.F.

RESTRICTED

RESTRICTEDBR 333(1)
Original**ELECTRONIC MARKER OUTFITS MDA-MDH****MDA-MDH****SUMMARY OF DATA**TRANSMITTER MARKER DATA
(TYPICAL)RETRANSMITTER MARKER DATA
(TYPICAL)CABINET MARKER GENERATORS
FITTED WITH
GENERATOR BEARING BIAS AND GENERATOR RANGE MARKER**PURPOSE**

To provide for the rapid presentation of information concerning surface and sub-surface targets by electronic markers on fixed and rotating coil displays.

BRIEF DESCRIPTION

The Marker Outfits accept range and bearing information in the form of synchro or magslip signals, and convert it into position and bearing marker signals for presentation on any type of display.

The accuracy of the numbers will be to within 0.5% of the sector value in use for range, and to within 0.7 degrees for bearing.

MAJOR UNITS

Pattern No	Description	Height	Width	Depth	Weight
5990-AP 196012 AP 196015	Transmitter Marker Data	12½ in	9 in	6½ in	14 lb
5990-AP 196007/11 AP 196013/14	Retransmitter Marker Data	19½ in	15½ in	10½ in	50-70 lb
5840-AP 172744	Cabinet Marker Generators	13½ in	14 in	15 in	30 lb (unladen)
5840-AP 172740	Generator Bearing Bias	8 in	6½ in	14½ in	8 lb
5840-AP 172741	Generator Range Marker	8 in	6½ in	14½ in	8 lb
5840-AP 172742	Generator Bearing Marker	8 in	6½ in	14½ in	8 lb
5840-AP 172743	Power Supply	12½ in	14 in	17½ in	79 lb
5840-AP 172745	Mixer, Electronic Marker	13½ in	14 in	8½ in	20 lb

POWER REQUIREMENTS

Mains Inputs 115 V, 60 Hz, 1 phase, 100 watts per marker
 Servo Reference 115 V, 400 Hz, 1 phase, 5 watts
 Relay Supply 14 V, d.c. 3 amps

RESTRICTED

RESTRICTED

HEAT DISSIPATION

Cabinet Marker Generators	AP 172744 complete with	
Generators, Bearing Bias	AP 172740 and Generator.	
Range Marker	AP 172741	100 Watts
Power Supply	AP 172743	100 Watts
Mixer Electronic Marker	AP 172745	6 Watts
Retransmitters Marker Data	AP 196007 and AP 196009	60 Watts
Retransmitters Marker Data	AP 196008	200 Watts
Retransmitters Marker Data	AP 196010	120 Watts
Retransmitters Marker Data	AP 196011 and AP 196014	100 Watts
Retransmitters Marker Data	AP 196013	150 Watts
Transmitters Marker Data	AP 196012 and AP 196015	10 Watts

HANDBOOK

BR 2392

ESTABLISHMENT LIST

E 1384

INSTALLATION SPECIFICATION

B 925



CABINET MARKER GENERATORS
FITTED WITH
GENERATOR BEARING MARKER



POWER SUPPLY UNIT



MIXER ELECTRONIC MARKER

RESTRICTED

SECTION 8CONTENTS LIST

710 Radar Aerial Outfit ADN
711 Radar Aerial Outfit AKC
712 Radar Aerial Outfit AKC(2)
713 Radar Aerial Outfit AKD
714 Radar Aerial Outfit AKE(1)

715 Radar Aerial Outfit AKE(2)
716 Radar Aerial Outfit AKK (see Type 903/904) (To be issued later)
717 Radar Aerial Outfit AKL (see Type 974 Section 6)
718 Radar Aerial Outfit AKN
719 Radar Aerial Outfit AKR

Radar Aerial Outfit AMG (see Type 957 Section 6)
Radar Aerial Outfit AMK Series (To be issued later)
Radar Aerial Outfit AML (To be issued later)
Radar Aerial Outfit AMM (To be issued later)
Radar Aerial Outfit ANS(1)(2)

Radar Aerial Outfit ANU(1)(2)(3)(4)
Radar Aerial Outfit ANU(6)
Radar Aerial Outfit AQQ(2)(3)
Radar Aerial Outfit AQR (see Types 277/293 Section 6)
Radar Aerial Outfit AQS

Radar Aerial Outfit AQT
Radar Aerial Outfit ATZ (see Type 978 Section 6)
Radar Aerial Outfit AUK (see Types 277/293 Section 6)
Radar Aerial Outfit AZF (see Type 975 Section 6)
Radar Aerial Outfit AZG (see Type 975 Section 6)

Radar Aerial Outfit AZJ (see 1006) (To be issued later)
Radar Aerial Outfit AZK (see 1006) (To be issued later)
Radar Aerial Outfit AZR

AERIAL OUTFIT ADN

ADN

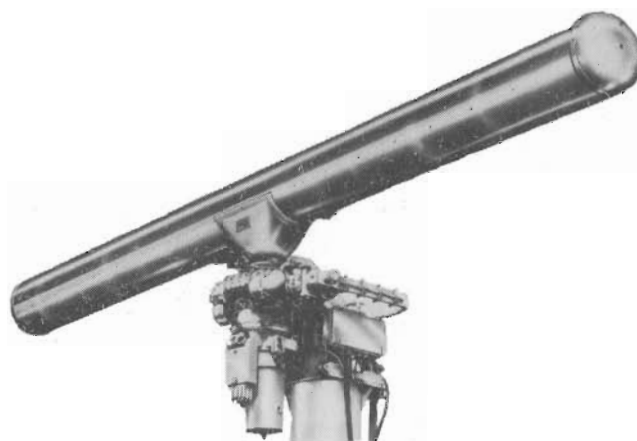
SUMMARY OF DATA

PURPOSE

For use with Type 992P and 992Q in association with G.W. Systems.

CHARACTERISTICS

Beamwidth	: 1.2 deg horizontal 30 deg vertical
Beam Elevation	: 15 deg
Gain	: Approx. 29.5 dB
Operating Frequency	: 2944 - 3052 MHz
Polarisation	: Vertical



BRIEF DESCRIPTION

The Aerial comprises a linear slotted array enclosed in a cylindrical plastic radome and the pedestal on which it is mounted is stabilised in the pitch and roll planes. The servo amplifier control equipment and the amplidyne generator are located in the radar office and the machinery space, respectively. Coarse and fine magflip transmissions provide accurate bearing information to the weapons system. These transmissions are corrected for the beam squint associated with linear slotted arrays. Compass correction is provided externally by the ship's Azimuth Retransmission Unit (R.T.U.).

The Aerial Speeds are 15 or 30 rev/min. The normal speed is 15 rev/min. At this speed, synchronisation with Aerial Outfit AKE is provided. The 30 rev/min facility is used exceptionally for navigational purposes. A ship's head marker is provided at both speeds.

Facilities are provided for hand training of the aerial and stowing in line with the ship's head. Waveguides, rotating joints and aerial are pressurised at 30 lb/sq².

MAJOR UNITS

5985-AP 186592	Aerial with guard.
5985-AP 186579	Pedestal, Aerial.
5985-AP 186637	Waveguide Assembly.
5840-AP 172854	Cabinet Aerial Control.
5840-AP 173203	Drawer Aerial Indicator.
5840-AP 173204	Drawer Aerial Control.
5840-AP 173205	Drawer Squint Correction.
5840-AP 173208	Drawer Servo Amplifier.
6115-AP 204079	AC/DC/DC/DC Motor Generator Amplidyne Module Control.

PHYSICAL DATA

Aerial length	21 ft		
Turning Circle	21 ft 6 in		
Height of pedestal with Aerial	6 ft 6 in		
Weight of pedestal	1054 lb		
Weight of Aerial	385 lb		
Control Cabinet	Height 56 in	Width 25½ in	Depth 26 in
Weight of Control Cabinet (Excluding Drawers)	500 lb approx.		

POWER SUPPLIES

440 V 60 Hz 3 phase - 3½ kVA for amplidyne generators.
220 V d.c. - 1 amp for aerial motor fields.
115 V 400 Hz single phase - 6 amp for servo amplifiers and magflips.
60 V 60 Hz single phase - 1 amp for amplidyne generator demagnetising circuits.
24 V d.c. - 2 amp for control gear.

HANDBOOK

BR 2524(1),(2),(3).

ESTABLISHMENT LIST

E1439

INSTALLATION SPECIFICATION

B960 Vols. 1 and 3 and Addenda A and B.

AERIAL OUTFIT AKC

AKC

SUMMARY OF DATA

PURPOSE

For use with Type 992.

BEAM WIDTH

Horizontal (to half power) 2°

Vertical (to half power) 32°

Beam elevated 15°

BRIEF DESCRIPTION

The aerial consists of a streamlined single cheese reflector for combined transmission and reception. It is stabilised for pitch and roll and in manual control is also stabilised in azimuth.

The aerial control system may be operated manually or automatically. In auto-training the aerial rotation speed may be switched to SLOW or FAST with preset speeds of 0-30 and 90 r.p.m.



AERIAL OUTFIT AKC

MAJOR UNITS

	Patt. No.	Description
	<u>Aerial Pedestal Assembly</u>	
1.	68586	Aerial Assembly for Outfit AKC
2.	68072	Pedestal Unit 58A
3.	68071	Reflector Design 9 with flare
4.	68083	Waveguide Assembly Design 3
	<u>Aerial Control Group (Assembly N)</u>	
5.	68106	Cabinet Design 44 Fire Detector
6.	68004	Meter Unit Design 11
7.	68105	Fire Detector Control Unit
8.	68172	Cabinet Design 36 Aerial Control
9.	68075	Aerial Indicator Unit
10.	68174	Relay Unit Design 54
11.	68076	Aerial Control Drawer, 41A
12.	68077	Amplifier Amplidyne Control Drawer 46J
13.	68078	Aerial Bearing Transmission Drawer Design 1
14.	68724	Cabinet Design 48 Air Cooling
15.	68101	Cooling Drawer Design 2
16.	68115	Board Distribution 40 way (2 in No.)
	<u>Miscellaneous</u>	
17.	68079	AC/DC/DC/DC Motor Generator Amplidyne
18.	68128	Stable Element Drawer
19.	68082	Stable Element

NOTES Items 2, 3 and 4 are housed in Item 1
 Items 6 and 7 are housed in Item 5
 Items 9 to 13 inc. are housed in Item 8
 Item 15 is housed in Item 14
 Items 18 and 19 are fitted in Assembly J

PHYSICAL DATA

Weight of mast fitted equipment	1500 lb approx.
Weight of office equipment	1500 lb approx.
Size of Reflector	12 ft by 4 ft approx. overall
Weight of rotating element	160 lb

POWER REQUIREMENTS

440 V 60 Hz 7.6 kVA

60 V 60 Hz 1 \emptyset 0.25 kVA120 V 333 Hz 3 \emptyset 0.312 kVA

RESTRICTED

HANDBOOK

BR 1189

ESTABLISHMENT LIST

E 1027

INSTALLATION SPECIFICATION

B 800(1)(2)(3).

RESTRICTED

RESTRICTEDBR 333(1)
Original**AERIAL OUTFIT AKC(2)****AKC(2)****SUMMARY OF DATA****PURPOSE**

For use with Type 882M.

BEAM WIDTH

Horizontal (to half power) 2°
 Vertical (to half power) 32°
 Beam elevated 15°

BRIEF DESCRIPTION

The aerial consists of a streamlined single cheese reflector for combined transmission and reception. It is stabilised for pitch and roll, protective circuits coming into operation if pitch exceeds $\pm 6^{\circ}$ and if roll exceeds $\pm 24^{\circ}$. The extreme mechanical limits of pitch and roll are $\pm 12^{\circ}$ and $\pm 32^{\circ}$ respectively. In manual training only the aerial is also stabilised in azimuth.

The aerial training control system normally operates in auto at constant speed, the manual control facility is primarily for testing and tuning purposes. In auto-training, the rotation speed may be switched to SLOW (0 - 12 r.p.m.) or FAST (45 r.p.m.).

**MAJOR UNITS**

	Patt. No.	Description
	<u>Aerial Pedestal Assembly</u>	
1.	68586A	Aerial Assembly for Outfit AKC.
2.	68072	Pedestal Unit 58A.
3.	68071A	Reflector Design 9 with flare.
4.	68083	Waveguide Assembly Design 3.
5.	68479	Hoisting & Assembly Framework.
	<u>Aerial Control Group (Assembly NN)</u>	
6.	68106	Cabinet Design 44 Fire Detector.
7.	68004	Meter Unit Design 11.
8.	68105	Fire Detector Control Unit.
9.	172817	Cabinet Aerial Control.
10.	68075	Aerial Indicator Unit.
11.	68174	Relay Unit Design 54.
12.	68076A	Aerial Control Drawer.
13.	68077A	Amplifier, Amplidyne Drawer.
14.	186272	Aerial Bearing Transmission Drawer.
15.	68115	Board Distribution 40 way (2 in No.)
	<u>Miscellaneous</u>	
16.	186272	Aerial Bearing Transmission Drawer (housed in Assembly GL).
17.	68079	AC/DC/DC/DC Motor Generator Amplidyne.
18.	68080	Starter for 5 h.p. Motor, 440 V.
19.	61394	Stable Element Drawer 400 Hz
20.	61388	Stable Element 400 Hz
21.	172006	Dry Air Distribution Unit.

NOTES: Items 2, 3 and 4 are housed in Item 1.
 Items 7 and 8 are housed in Item 6.
 Items 10 to 14 inc. are housed in Item 9.
 Items 19, 20 and 21 are fitted in Assembly JJ - Cabinet R.F. Monitoring.

PHYSICAL DATA

Weight of mast fitted equipment 1500 lbs approx.
 Weight of office equipment 1800 lbs approx.
 Size of Reflector 12 ft by 4 ft approx. overall
 Weight of rotating element 160 lbs

RESTRICTED

RESTRICTED

POWER REQUIREMENTS

440 V 60 Hz 7.6 kVA
60 V 60 Hz 1 Ø 0.25 kVA
115 V 400 Hz 3 Ø 0.312 kVA
220 V d.c. 0.25 kW.

HANDBOOK

BR 2418(1)(2)

ESTABLISHMENT LIST

E 1324

INSTALLATION SPECIFICATION

M 5145 Appendix 'F' and Addenda 'A' and 'B'.

RESTRICTED

AERIAL OUTFIT AKD

AKD

SUMMARY OF DATA

PURPOSE

Aerial Outfit AKD is used with Type 993. medium range sea/air warning radar.

FREQUENCY RANGE

S-band frequency.

BEAM WIDTH

Horizontal 2° (approximately).

BRIEF DESCRIPTION

Aerial Outfit AKD is a directional S-band transmitting and receiving aerial, rotating at a constant speed of 24 rev/min. The aerial is not stabilised.



MAJOR UNITS

AP No.	Description
186207	Aerial Reflector
186208	Aerial Pedestal
186210	Rotary r.f. Coupler
186209	Data Transmission Unit
204026	Motor 2 hp
186365	Aerial Control Unit

AERIAL OUTFIT AKD

PHYSICAL DATA

Total weight of Aerial Outfit on Masthead Platform	- 1040 lb
Aerial Reflector	- 350 lb
Aerial Pedestal	- 570 lb
Motor	- 100 lb
Overall height of Aerial Outfit	- 6 ft 3 in
Sweep circle radius of reflector	- 8 ft 1 in

POWER REQUIREMENTS

Aerial Training Motor	440 V 60 Hz 3 phase
Aerial Motor Brake	440 V 60 Hz 3 phase
Ship's Head Marker	24 V d.c.
Air Condition Unit	
AP 53177A	230 V 50 Hz single phase
W.8828A/B/C	(Motor 50 V 50 Hz 3 phase Heater 115 V d.c.)

ESTABLISHMENT LIST

E1294

INSTALLATION SPECIFICATION

B918

HANDBOOK

BR 2369

AERIAL OUTFIT AKE(1)

AKE(1)

SUMMARY OF DATA

PURPOSE

Aerial Outfit AKE is used with Type 965 to provide long range air warning in small ships.

FREQUENCY RANGE

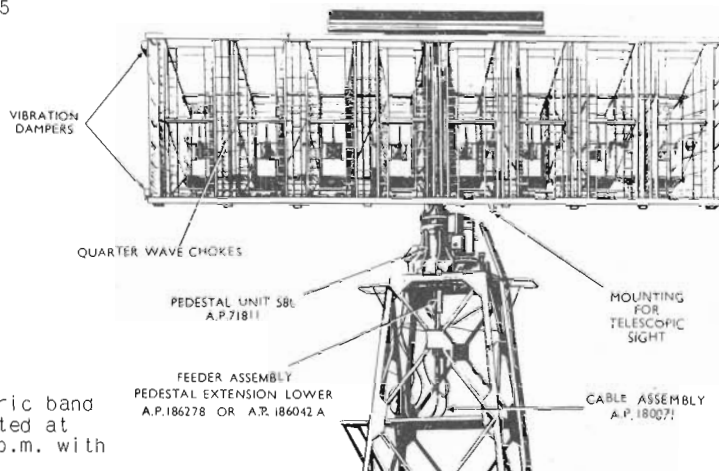
217 to 224 MHz

BEAM WIDTH

Horizontal -12° (approx.)

BRIEF DESCRIPTION

Aerial Outfit AKE is a directional metric band transmitting and receiver aerial. It is rotated at 10 r.p.m. using a 440 V, 60 Hz supply or 8 r.p.m. with 400 V 50 Hz. The aerial is not stabilised.



MAJOR UNITS

AP No.	Description
718108	Aerial Array 78A
186042A	Feeder Assembly - Cablefeed to Aerial
186278	Pedestal Ext. lower - coaxial air spaced feed to Aerial
71811	Pedestal Unit, 58L

AERIAL OUTFIT AKE

0628-422-1276
S/N 872/000/40/75

The I.F.F. Mk. 10 Aerial, AT-352/UPA-22A (MSA) is integral with Aerial Array 78A

PHYSICAL DATA

Total weight of Aerial Outfit including I.F.F. Mk. 10 Aerial - 2425 lb (approx.)
 Aerial Array 78A - 1430 lb
 Pedestal Unit 58L - 750 lb

Overall height of Aerial Outfit including I.F.F. Mk. 10, above ship's mast platform - 11 ft 7 in.
 Overall size of rotating Aerial Array - 26 ft wide, 8 ft 11 in high, 6 ft 1 in deep.

POWER REQUIREMENTS

Aerial training motors : 440 V 60 Hz or 400 V 50 Hz
 Aerial motor brake : 440 V 60 Hz or 400 V 50 Hz 3 phase for motor AP 204039
 Ship's Head Marker : 50 V d.c. 1 phase for motor AP 204059
 Air Conditioning Unit : 230 V 50 Hz or 440 V 60 Hz 3 phase

HANDBOOKS

BR 1186

US Navy Department, Bureau of Ships instruction 1B-739 (MSA) for I.F.F. Mk. 10 Aerial.

ESTABLISHMENT LIST

E 1230

INSTALLATION SPECIFICATION

B 359

RESTRICTEDBR 333(1)
Original**AERIAL OUTFIT AKE(2)****AKE(2)****SUMMARY OF DATA****PURPOSE**

Aerial Outfit AKE(2) is used with Type 965P to provide long range air warning in small ships.

FREQUENCY RANGE

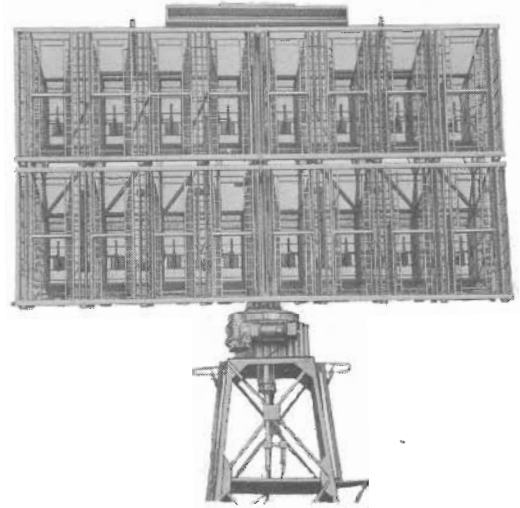
217 to 224 MHz

BEAMWIDTH

Horizontal 12° (approximately).

BRIEF DESCRIPTION

Aerial Outfit AKE(2) is a directional metric band transmitting and receiving aerial. It rotates at a constant speed 10 r.p.m. using 440 V 60 Hz supply. The aerial is not stabilised.



AERIAL OUTFIT AKE(2)

MAJOR UNITS

AP No.	Description
186241	Aerial Array
186278	Feeder Assembly, Pedestal Extension, Lower
186247	Pedestal Unit
186384	Joint Rotating r.f. 2 channel in container

Antenna 1971 BKA 104
Pedestal, BKA 105 } ST School

The I.F.F. Mk. 10 Aerial, AT-352/UPA-22A (MSA) is integral with Aerial Array.

PHYSICAL DATA

Total weight of Aerial Outfit including I.F.F. Mk.10 Aerial - 5840 lb (approximately)

Aerial Array (including Feeder Assembly, Pedestal Extension Lower) - 3390 lb

Pedestal Unit - 1940 lb

Joint, Rotating, r.f. - 150 lb

The overall height of Aerial Outfit including I.F.F. Mk.10 above ship's mast platform - 19 ft 3 in

Overall size of rotating Aerial Array - 26 ft wide, 16 ft 9 in high, 6 ft 1 in deep.

POWER REQUIREMENTS

Aerial Training Motor 440 V 60 Hz

Aerial Motor Brake 440 V 60 Hz

Ship's Head Marker 50 V d.c.

Air Conditioning Unit 230 V 50 Hz single phase of 440 V 60 Hz 3 phase.

HANDBOOKS

BR 2342

US Navy Department, Bureau of Ships instruction 1B-739 (MSA) for I.F.F. Mk. 10 Aerial.

ESTABLISHMENT LIST

E 1230

E 1479

INSTALLATION SPECIFICATION

B 312.

RESTRICTED

RESTRICTEDBR 333(1)
Original**AERIAL OUTFIT AKN****AKN****SUMMARY OF DATA****PURPOSE**

For use with Radar Type 963.

BEAM WIDTH

Horizontal (to half power) $1^{\circ} \pm 0.2^{\circ}$.
 Vertical (to half power) $1.65^{\circ} - 1.85^{\circ}$
 Elevation angle of beam axis is normally 3.5°
 but adjustable by Dockyard between 2° and 4° .

BRIEF DESCRIPTION

The aerial consists of a radome-enclosed reflector, the flare being situated in the focal plane of the reflector for combined transmission and reception on a nominal wavelength of 3 cm., horizontally polarized. It is stabilised for roll and pitch, when the training axis is aligned vertically with the stable element up to angles of $\pm 4^{\circ}$ Pitch and $\pm 10^{\circ}$ Roll. When unstabilised, the training axis is automatically aligned perpendicular to the deck of the ship.

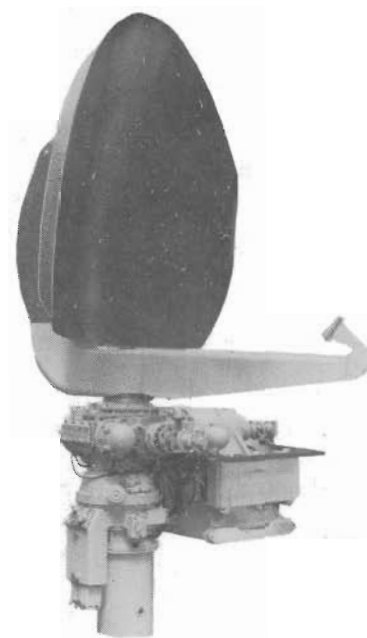
The aerial training motion may be controlled either automatically or manually if this facility is incorporated. In auto-training, an amplidyne servo controls the aerial and gives continuous rotation from approximately 0 to 35 r.p.m. or 45 to 60 r.p.m. in two stages.

MAJOR UNITS

AP No.	Description
<u>Aerial Pedestal Assembly</u>	
1. 62670	Pedestal Unit 58F
2. 62690	Reflector Assembly for Aerial Outfit AKN
3. 64173	Waveguide, Size 16, Design 3
4. 64174	Waveguide, Size 16, Design 4
5. 62662	Radome, Design 2
<u>Aerial Control Group</u>	
6. 68106	Cabinet Design 44 Fire Detector
7. 68004	Meter Unit Design 11
8. 68105	Fire Detector Control Unit
9. 68172	Cabinet Design 36 Aerial Control
10. 68075	Aerial Indicator Unit
11. 68174	Relay Unit Design 54
12. 68076	Aerial Control Drawer 41A
13. 68077	Amplifier Amplidyne Control Drawer 46J
14. 68078	Aerial Bearing Transmission Drawer
15. 68724	Cabinet Design 48 Air Cooling
16. 68101	Cooling Drawer Design 2 (for A.C. Ships)
17. 68102	Cooling Drawer Design 3 (for D.C. Ships)
18. 64350	Power Distribution Board, 59G
19. 64352	Power Distribution Board, 59H
<u>Miscellaneous</u>	
20. 68079	AC/DC/DC/DC Motor Generator Amplidyne (A.C. Ships)
21. 68099	DC/DC/DC/DC Motor Generator Amplidyne (D.C. Ships)
22. 68128	Stable Element Drawer
23. 68082	Stable Element
24. 62671	Stable Element Cabinet, Design 175
25. W8828B	Air Conditioning Unit SE.2

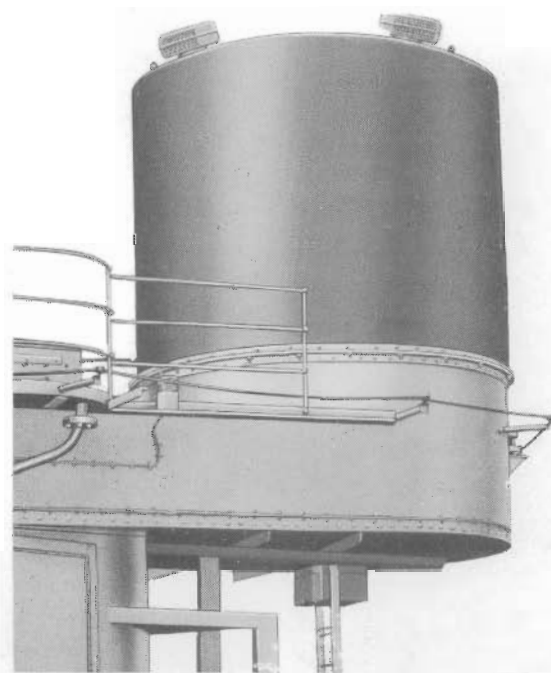
NOTES: Items 7 and 8 are housed in Item 6
 Items 10 to 14 are housed in Item 9
 Items 16 and 17 are housed in Item 15
 Items 22 and 23 are housed in Item 24
 Items 22 and 23 are first-ship fitting items

Subsequent installations will incorporate stable element AP 61388 and drawer AP 61394.



AERIAL ASSEMBLY
AERIAL IS ENCLOSED BY A RADOME

AERIAL ASSEMBLY
(RADOME REMOVED)



RADOME FITTED

RESTRICTED

RESTRICTED

PHYSICAL DATA

Weight of Platform - located Equipment	: 1380 lb approx.
Weight of Office Equipment	: 1500 lb approx.
Side of Reflector	: 7 ft 6 in by 4 ft 6 in
Aperture of Reflector	: 7 ft 6 in by 4 ft 6 in
Weight of Rotating Equipment	: 180 lb approx.
Size of Radome	: 9 ft by 8 ft 8 in
Weight of Radome	: 400 lb approx.

POWER REQUIREMENTS

- (a) 220 V d.c. 7.7 kW for amplidyne set, heat exchanger, split field servo amplifiers, control circuits, and aerial motor fields.
- or
- (b) 440 V, 60 Hz 3-phase, 7.6 kVA, for amplidyne set heat exchanger motor.
- (c) 50 V, 50 or 60 Hz, 1-phase, 0.25 kVA for amplidynes.
- (d) 180 V, 400 or 500 Hz, 1-phase, for amplidyne amplifiers and magslips.
- (e) 120 V, 333 Hz, 3-phase 0.3 kVA, for stable element AP 68082 (first-ship fitting item): 115 V, 400 Hz, for stable element AP 61388 in subsequent installation.

HANDBOOK

BR 1557(4) A and B

ESTABLISHMENT LIST

E 1109

INSTALLATION SPECIFICATION

B 840 in 3 Parts

RESTRICTED

AERIAL OUTFIT AKR

AKR

SUMMARY OF DATA

PURPOSE

Aerial Outfit AKR replaces Aerial Outfit AQS as the aerial for Type 982, converting the latter to Type 982M when certain additional modifications to the receiver and metadyne units are included. It provides long range air and surface warning with high bearing accuracy. The display obtained is used for aircraft direction and also for azication, ie training the height finding Aerial Outfit AQT of Type 982 on a selected target. Normally two Aerial Outfits AKR are fitted, one forward and one aft. Ships normally fitted are light fleet carriers and A.D. frigates.

BEAM WIDTH

Vertical : $8\frac{1}{2}^{\circ}$ (to half field strength)
Beam is "shaped" to produce constant height cover up to 30° angle of sight.

Horizontal : approximately 1° .

BRIEF DESCRIPTION

The aerial comprises an S-band cylindrical reflector of spaced rods, all made in light alloy, illuminated by a slotted waveguide system running parallel with the axis of the reflector and fed from a parabola, in order to provide constant height cover.

The whole is mounted on the original Aerial Outfit AQS pedestal and is spaced to clear the turning circle of the Aerial Outfit AQT, where necessary, by an extension mast, which is supplied as a dockyard or contractor's item to suit each ship.

Both the reflector and the waveguide feeder systems are made in three units, a centre section, left and right hand sections, to facilitate storage and shipment.

Patt. 57592 Control Unit 20M gives local control of aerial training and Patt. 57858 Control Unit (not supplied with Outfit AKR) permits remote control from the R.D.R.

The speed of rotation is 0-7 r.p.m. (continuously variable). Owing to its large beam width in the vertical plane "Roll Along" and "Roll Across" stabilisation ("Level" and "Cross Level" stabilisation) is unnecessary, but the AQS method of stabilisation in azimuth is retained in order to maintain synchronism with Type 960 when this aerial feeds into a common display system.

MAJOR UNITS

Aerial Outfit AKR comprises D.R.E. and D.E.E. items as follows:
(This is not a complete Parts List)

AP No.	Description	AP No.	Description
D.R.E. ITEMS			
1. 53177	Air Conditioning Unit, Design 4	7. 63191	Waveguide Size 10, elbow, flange, major 90°
2. 57592	Control Unit 20M	8. 63192	Waveguide Size 10, connection, Design 1
3. 62254	Pedestal Unit 58E	9. 63193	Waveguide Size 10, connection, Design 2
4. 62256	Aerial Feed Linear Array	10. 63194	Waveguide taper, Size A to Size 10
5. 62257	Reflector Unit, Design 12	11. 63195	Waveguide Size A, connection, Design 103
6. 63190	Waveguide Size 10, matched termination	12. 66917	Indicator, Bearing, Tape Type (2)
D.E.E. ITEMS			
13. Metadyne Set comprising:		15. Starter for Metadyne Set	
(a) Twin Metadyne Generator MD75/74-G		(a) Automatic back E.M.F. starter (for D.C. Ships)	
(b) Metadyne driving motor AY115AT (D.C. Ships) or Metadyne driving motor AY128Z (A.C. Ships)		(b) Automatic direct starter (for A.C. Ships)	
14. Motor, Training 1419ASX.		16. Contactor Control Panel	
		17. Amplifier MD49	

NOTES 1. Item 11 is to be supplied only when Aerial Outfit AKR is mounted on extension mast.
2. Item 3 is the pedestal of Aerial Outfit AQS to which is added a fabricated mounting unit (Pattern 62255) for attachment of the aerial mast.

RESTRICTED

PHYSICAL DATA

Weight of Aerial Reflector and Feed : 850 lb
Weight of Support Mast and Working Platform : depends on height which varies with site, with a maximum of 1200 lb for 16 ft 6 in.
Weight of Pedestal Unit 58E : 5830 lb
Span of Aerial : 26 ft 6 ins (turning circle)
Height of Reflector : 3 ft (approx.)

POWER REQUIREMENTS

220 V d.c. : 20 amps
240 V d.c. : 15 amps max.
200 V 1100 Hz single phase : 5 amps
50 V 50 Hz three phase : 5 amps
The above include supplies to Patt. 57592 Control Table 20 M.

HANDBOOK

BR 2107(1)(2)(3) and Addendum

ESTABLISHMENT LIST

E 1090

INSTALLATION SPECIFICATION

B 789

RESTRICTED

AERIAL OUTFITS ANS SERIES

ANS(1)
ANS(2)

SUMMARY OF DATA

PURPOSE

For use with Types 2930/2930 (A.C. Ships).

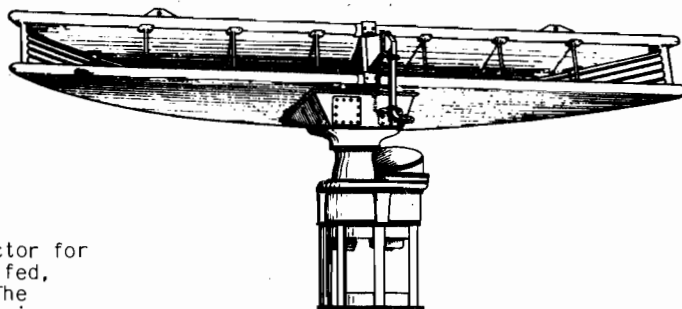
BEAM WIDTH

Horizontal 2° } To half field strength
Vertical 35° }

BRIEF DESCRIPTION

The aerial consists of a single cheese reflector for combined transmission and reception, waveguide-horn fed, mounted horizontally, and horizontally polarised. The cheese is tilted upwards so that the direction of maximum field strength in the vertical plane is elevated by 15° above the horizon.

The amplidyne aerial system may be operated manually or automatically. In auto-training the aerial rotation speed may be 5, 10, or 15 rev/min. The aerial is stabilised in azimuth.



AERIAL OUTFIT ANS

MAJOR UNITS

AP No.	Description
ANS(1)	
65605/A	Pedestal Unit 19AS
65486/A	Reflector Unit ANS
65591	Control Unit 20 W
59376	Motor Generator
65293A	Contactor Unit Design 8 } Not in A.C. Ships
67540	Motor Generator
67739	Contactor Unit 50A } A.C. Ships only
67720	Rectifier Unit
ANS(2)	
As for ANS(1) but the first two units are replaced by Pattern No. 63201/A Aerial Unit Design 49, which includes the aerial waveguide.	

PHYSICAL DATA

ANS(1)(2)
Weight of mast-fitted equipment 6 cwt
Weight of Motor Generator and Contactor Unit 3 cwt
Weight of Control Unit 546 lb

Size of reflector:- Aperture 12 ft by 5 $\frac{13}{16}$ in. Vertical clearance above fixing level 3 ft 11 in.

POWER REQUIREMENTS

230 V 50 Hz 3 phase
180 V 500 Hz 1 phase
50 V 50 Hz 1 phase
220 V d.c., or 440 V 60 Hz 3 phase (A.C. Ships)
22 V d.c.
These supplies are included in those for radars
Types 2930/2930 A.C. Ships

REMARKS

Because of its special application to Target indication the aerial is generally rotated continuously at the maximum speed.

HANDBOOKS

ESTABLISHMENT LIST

INSTALLATION SPECIFICATION

BR 1918 Aerial Outfits ANS
BR 1194 Aerial Outfits ANS
Series

E 937

8721

AERIAL OUTFITS ANU(1), ANU(2), ANU(3) AND ANU(4)

SUMMARY OF DATA

ANU(1)
ANU(2)
ANU(3)
ANU(4)

PURPOSE

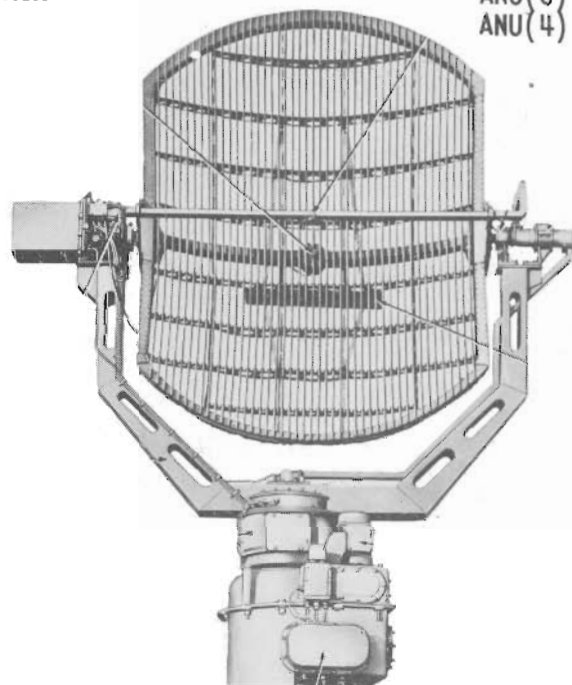
For use with Radars Type 277Q and 278, height finding and surface warning.

BEAM WIDTHS

4.5° Horizontal
2.5° Vertical To half field strength.

BRIEF DESCRIPTION

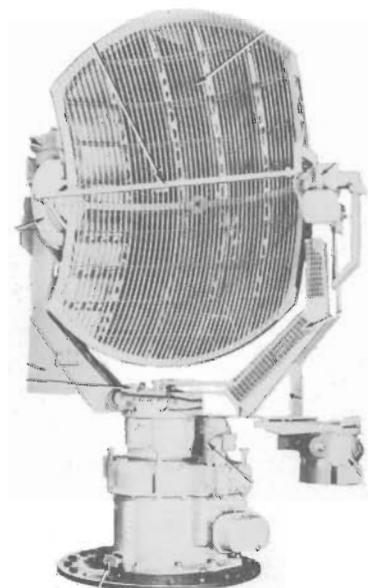
- ANU(1) Elevation stabilisation is by means of a mechanical air and oil system, controlled by an air driven vertical gyro. Azimuth stabilisation and elevation setting are controlled by an 'M' Type transmission system.
- ANU(2) Stabilisation in line of sight is all electric. Elevation control is by mag slip. Azimuth stabilisation as for ANU(1).
- ANU(3) Basically ANU(1) aerial with a different Bearing Transmission Unit.
- ANU(4) Basically ANU(2) aerial with an ANU(1) Bearing Transmission Unit.



ANU(1)(3)

MAJOR UNITS

AP No.	Description
ANU(1), ANU(3)	
65742A	Reflector Unit
657418	Pedestal Unit 19AT
657438	Control Table
55727A	Elevation Control Unit, Des. 2 (when H.P.I. facilities are fitted)
55679A	Elevation Control Unit, Des. 1 (when H.P.I. facilities are not fitted)
186071	Bearing Transmission Unit {ANU(1)}
186073	Bearing Transmission Unit {ANU(3)}
ANU(2), ANU(4)	
70005	Reflector Unit, Des. 15, Outfit ANU(2)
64620	Pedestal Unit 58J
70210	Control Table
70012	Control Unit, Des. 131
65029	Control Unit, Des. 126
70013	Starter
71302	Auxiliary Control Panel {D.C.
70217	M.G. Set {Ships
70487	Starter
71301	Auxiliary Control Panel {A.C.
70011	M.G. Set {Ships
186072	Bearing Transmission Unit {ANU(2)}
186071	Bearing Transmission Unit {ANU(4)}



ANU(2)(4)

PHYSICAL DATA

ANU(1), ANU(3)

Overall Height of Aerial 12 ft 9 in
Turning Circle (Radius) 5 ft 1 in
Weight 2300 lb
Control Table Height 2 ft 6 in
Width 4 ft Depth 2 ft
Weight 546 lb

ANU(2), ANU(4)

12 ft 9 in
4 ft 9 in
2900 lb
As for ANU(1)

RESTRICTED

POWER REQUIREMENTS

ANU(1), ANU(3)

230 V 50/60 Hz 3 phase

180 V 500 Hz

50 V 50/60 Hz

24 V d.c.

220 V d.c.

115 V 400 Hz

ANU(2), ANU(4)

As for

ANU(1), ANU(3)

with addition of

440 V 60 Hz 3 phase

(A.C. ships only)

HANDBOOK

BR 1195(1)(2)

ESTABLISHMENT LIST

E 1170

INSTALLATION SPECIFICATION

Aerial Outfit B836

Control Table B837/8

RESTRICTED

RESTRICTEDBR 333(1)
Original**AERIAL OUTFIT ANU(6)****ANU(6)****SUMMARY OF DATA****PURPOSE**

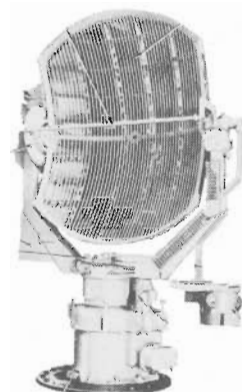
For use with Radars Type 277Q or 278, height finding and surface warning.

BEAM WIDTHS

4.5° Horizontal }
2.5° Vertical } To half field strength

BRIEF DESCRIPTION

The aerial consists of a cut paraboloid reflector for combined transmission and reception. It is stabilised electrically in azimuth and elevation. Training control is by hand using a selsyn system or automatic by means of a voltage regulator giving variable speeds (0-9 rev/min) in either direction. Elevation control is by a handwheel driven mag slip giving 0-+45° angle of sight with provision for using an automatically controlled aerial nod movement of $\pm 4^\circ$ of five second period.

**MAJOR UNITS**

AP No.	Description
70005	Reflector Unit Design 15
64620	Pedestal Unit 58J
186054	Aerial Control Cabinet (Framework only)
186239	Cabinet, Voltage Generator
70010	Amplifier Assembly Mk. 68AA
70013	Starter
71302	Control Unit } D.C. Ships
70217	M.G. Set }
70487	Starter }
71301	Control Unit } A.C. Ships
70011	M.G. Set }
186236	Bearing Transmission Unit

PHYSICAL DATA

Overall Height of Aerial 12 ft 9 in
Turning Circle (Radius) 4 ft 9 in
Weight 2900 lb

Aerial Control Cabinet Width 5 ft 1 in Depth 2 ft 2 in Height 2 ft 3 in Weight 440 lb

POWER REQUIREMENTS

230 V 50/60 Hz three-phase
220 V d.c.
24 V d.c.
115 V 60 Hz single-phase
440 V 60 Hz three-phase (A.C. Ships only)
115 V 440 Hz three-phase
+300 V d.c. stabilised
-300 V d.c. stabilised

HANDBOOK

BR 2423(1)(2) - Aerial Outfit ANU(6)

ESTABLISHMENT LIST

E 1265

INSTALLATION SPECIFICATION

B 395

RESTRICTED

AERIAL OUTFITS AQQ(2) AND AQQ(3)

AQQ

SUMMARY OF DATA

PURPOSE

For use with Type 960 to give aircraft warning and height estimation.

FREQUENCIES

Five spot frequencies:-

90.0 MHz, frequency code F	} Obsolescent
88.0 MHz, frequency code D	
86.0 MHz, frequency code B	
84.4 MHz, frequency code M	
82.8 MHz, frequency code L	

AERIAL ROTATION SPEED

Up to 7 rev/min. clockwise; up to 2 rev/min. counter-clockwise.

BEAM WIDTH

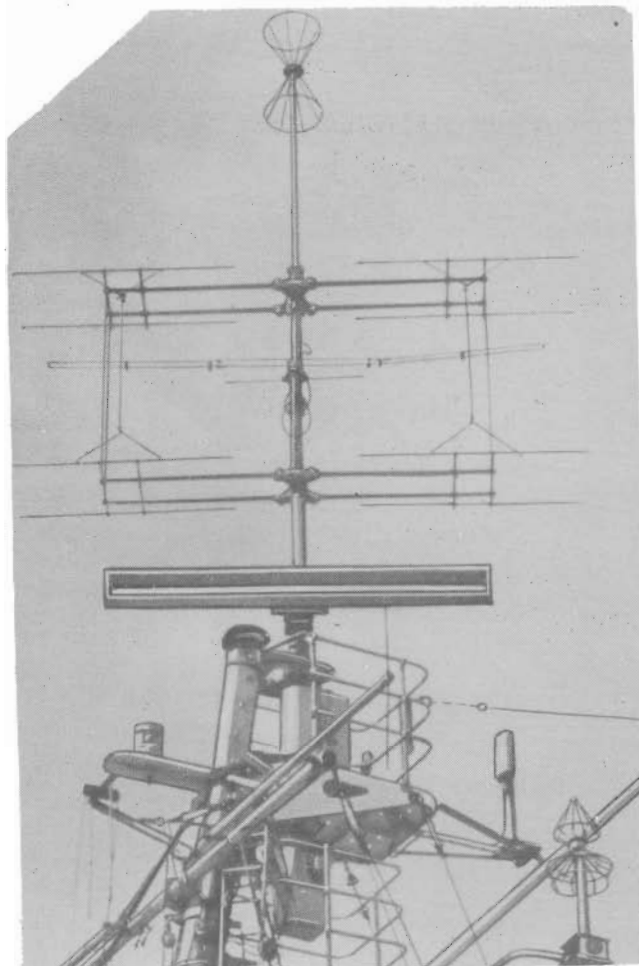
35° horizontal.

AERIAL GAIN

18 dB

BRIEF DESCRIPTION

The aerial array consists of two 'box' elements, each consisting of two half-wave dipoles and reflectors. Training speed and direction is controlled either from Control Unit 20N (AQQ(2)) or Control Unit Des. 128 (AQQ(3)) in the Type 960 Office, or from Control Unit 20P (960, 982 combination) or Control Unit Des. 46 (960, 277 combination) in the R.D.R. The aerial is stabilised in azimuth. AQQ(2) provides M-type aerial true bearing transmission and AQQ(3) provides magflip transmission to type Type 960 displays.



AERIAL OUTFIT AQQ - MASTHEAD ASSEMBLY

MAJOR UNITS

AP No.	Description
57604A or 64623	Control Unit 20N (AQQ(2)) Control Unit Des. 128 (AQQ(3))
59376 or 67540	Motor Generator, Servo (d.c. ships) Motor Generator, Servo (a.c. ships)
57692	Pedestal Unit 19AL
65293A or 67739	Contactor Unit Des. 8 (d.c. ships) Contactor Unit 50A (a.c. ships)
63899 67720	Aerial Dipole Des. 5 Rectifier Unit, 220 V d.c. 1 kW (some a.c. ships)

POWER REQUIREMENTS

230 V 50/60 Hz single phase
50/60 V, 50/60 Hz single phase (in same phase as 230 V)
220 V d.c.
24 V d.c.
Gyro supplies

POWER SUPPLY OUTFITS

Supply Outfits DVH, DVJ or DVN in d.c. ships.
Supply Outfit DYF in a.c. ships.

RESTRICTED

HANDBOOK

BR 1339

ESTABLISHMENT LIST

E 851

INSTALLATION SPECIFICATIONS

B 827 (AQQ(2))
B 640/R3 (Type 960)

RESTRICTED

AERIAL OUTFIT AQS

AQS

SUMMARY OF DATA

PURPOSE

Aerial Outfit AQS is used with Type 982 to provide long range warning of air and surface targets, with high bearing accuracy and without any interruption of coverage throughout its very wide vertical cover. The display obtained is used for fighter direction and also for azication, ie training the height-finding Aerial Outfit AQT of Type 983 on the required target.

BEAM WIDTH

Horizontal : 2.2° (to half field strength)
Vertical : 19° (Total angle swept)(to half field strength)

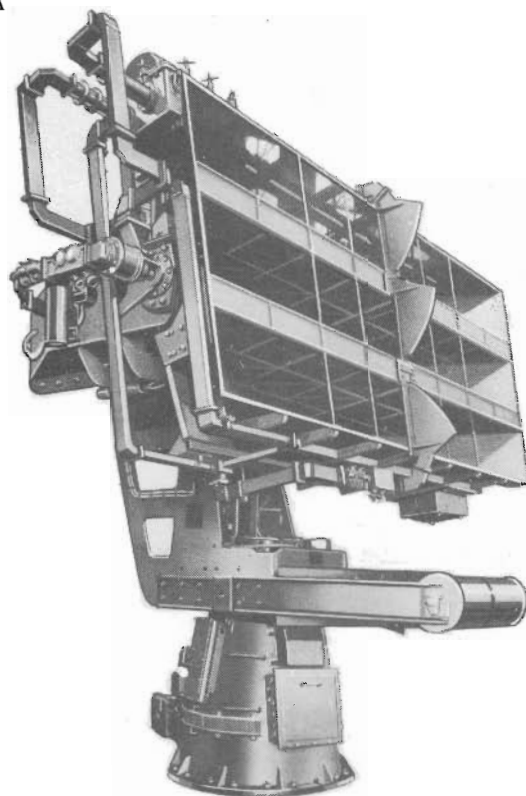
BRIEF DESCRIPTION

The aerial comprises of a stack of three vertical mounted reflectors and the array being triaxially stabilised to 6 minutes of arc, with a training speed continuously variable to maximum 7 revs per minute.

Pattern 57592 Control Unit 20M supplies local control of aerial training and Pattern 57858 Control Unit 20P supplying remote control, ie control from Radar Display Room.

MAJOR UNITS

Aerial Outfit AQS comprises D.R.E., D.N.O. and D.E.E. items as follows:



AERIAL OUTFIT AQS

D.R.E. ITEMS

AP No.	Description	AP No.	Description
1. 53177	Air Conditioning Unit Design 4	11. 65115	Waveguide Size 'A' Joint Rotating Design 2
2. 56773	Waveguide size 'A' Matching Unit	12. 65116	Oil Pressure Generating Unit Design 1
3. 56807	Standing Wave Ratio Indicator	13. 65117	Oil Pressure Generating Unit Design 2
4. 57592	Control Unit 20M	14. 65118	Clutch Operating Unit Outfits AQS/T
* 5. 57600	Deck Plane Corrector	15. 65125	Hoisting Gear for Outfit AQS
6. 59051	Waveguide size 'A' flare Design 15	16. 65126	Hoisting Gear for Stabiliser Outfit AQS
7. 59052	Waveguide size 'A' flare Design 16	17. 65294	Amplifier W5
8. 65100	Aerial Unit Design 30	18. 66439	Contactor Unit Design 10
9. 65108	Azimuth Stabiliser Corrector Design 1	19. 66917	Indicator Bearing Tape Type
10. 65114	Waveguide size 'A' Joint	20. 66923	Waveguide Size 'A' Phase Changer

Items 2, 3, 6, 7, 9, 10, 11, 12, 13, 14, 18 and 20 are components of Item 8.
Item 17 is a component of Item 5.

* Only one Patt. 57600 Deck Plane Corrector is allowed per Ship irrespective of number of Outfits AQS and AQT fitted. The deck plane corrector is omitted when AQS is fitted by itself.

D.N.O. ITEMS

- | | |
|----------------------|-----------------------|
| 1. Stabiliser M Mk I | 2. Stabiliser M Mk II |
|----------------------|-----------------------|

D.E.E. ITEMS

1. Metadyne Set comprising:

- (a) Metadyne Generator (MD/74CW)
- (b) Twin Metadyne Generator (MD75G/74G)
- (c) Metadyne Driving Motor (AY115AT)

2. Motor (Roll along and Roll across) AY118BZ

- 3. Motor (Training) 1419ASX
- 4. Auto Starter (30 amps B.E.M.F.) for Metadyne Set
- 5. R.P.C. Contactor Control Panel
- 6. Amplifiers MD45, MD49

Item 1 (D.N.O.), Item 2 (D.E.E.) and Item 3 (D.E.E.) are components of Item 8 (D.R.E.)

RESTRICTED

PHYSICAL DATA

Aerial Unit weighs approximately 7 tons.

Reflector Assembly measures 12 ft by 5 ft by 3 ft

POWER REQUIREMENTS

110 V d.c. - 20 amps (60 amps peak)
24 V d.c. - 20 amps (including 5 amps for stabilisers)
200 V 1100 Hz 1 phase - 5 amps (including supply to the 200/20 V transformer in Distn. Board)
20 V 1100 Hz 1 phase - 7 amps (from the 200/20 V transformer in Distn. Board)
120 V 333 Hz 3 phase - 2.4 amps (13.6 amps for first 4 mins)
50 V 50 Hz 3 phase - 5 amps.

HANDBOOK

BR 2107(1)(2)(3)

ESTABLISHMENT LIST

E 854

INSTALLATION SPECIFICATION

B 671 (Key Diagrams)
B 672 (Aerial Outfit AQS)

RESTRICTED

AERIAL OUTFIT AQT

AQT

SUMMARY OF DATA

PURPOSE

Aerial Outfit AQT is used with Type 983 and Display Outfit JS (Panel L48) for accurate height-finding. When not required for height-finding it can be used for providing surface and low air warning. When height-finding it is trained on the target by azication from a Type 982/960 display.

BEAM WIDTH

Horizontal - 5° (to half field strength)

Vertical - 2.1° (to half field strength)

BRIEF DESCRIPTION

The aerial is triaxially stabilised to 6 minutes of arc and has a training speed continuously variable to maximum of 7 revs per minute.

MAJOR UNITS

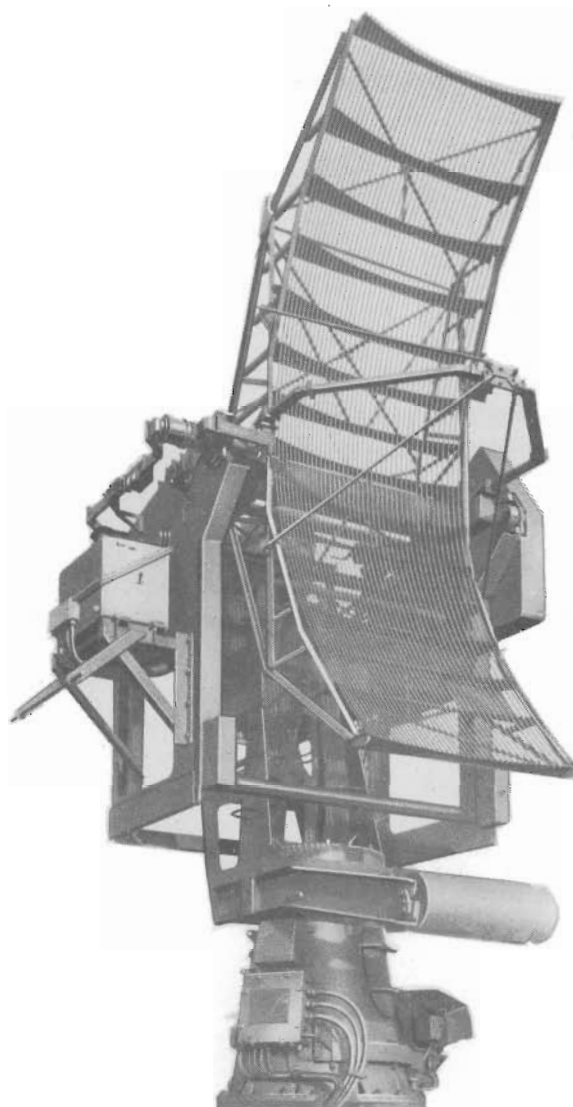
Aerial Outfit AQT comprises the following D.R.E., D.N.O. and D.E.E. items as follows:

D.R.E. ITEMS

AP No.	Description
1. 53177	Air Conditioning Unit Design 4
2. 56773	Waveguides Size 'A' Matching Unit
3. 56807	Standing Wave Ratio Indicator
4. 57592	Control Unit 20M
*5. 57600	Deck Plane Corrector
6. 59997	Waveguide Size 'A' Flare Design 17
7. 65109	Azimuth Stabilisation Corrector Design 2
8. 65110	Clutch Unit Outfit AQS/T
9. 65114	Waveguide Size 'A' Joint Rotating Design 1
10. 65115	Waveguide Size 'A' Joint Rotating Design 2
11. 65116	Oil Pressure Generating Unit Design 1
12. 65117	Oil Pressure Generating Unit Design 2
13. 65118	Clutch Operating Unit Outfits AQS/T
14. 65127	Hoisting Gear for Outfit AQT
15. 65128	Aerial Unit Design 31
16. 65294	Amplifier W5
17. 66439	Contactor Unit Design 10
18. 66917	Indicator Bearing Tape Type

Items 2, 3, 6, 7, 8, 9, 10, 11, 12, 13 and 17 are components of Item 15. Item 16 is a component of Item 5.

AERIAL OUTFIT AQT



* Only one Patt. 57600 Deck Place Corrector is allowed per ship irrespective of number of Outfits AQS/T

D.N.O. ITEMS

- | | |
|----------------------|-----------------------|
| 1. Stabiliser M Mk I | 2. Stabiliser M Mk II |
|----------------------|-----------------------|

D.E.E. ITEMS

- | | |
|---|---|
| 1. Metadyne Set comprising:- | 2. Motor (Roll along and Roll across) AY1188Z |
| (a) Metadyne Generator (MD74CW) | 3. Motor Training (1419ASX) |
| (b) Twin Metadyne Generator (MD75G/75G) | 4. Auto Starter (30 amps B.E.M.F.) for Metadyne Set |
| | 5. R.P.C. Contactor Control Panel |

Item 1 (D.N.O.), Item 2 (D.N.O.), Item 2 (D.E.E.) and Item 3 (D.E.E.) are components of Item 15 (D.R.E.).

PHYSICAL DATA

Aerial Unit weighs approximately 7 tons

Reflector Measures 14 ft 6 in high by 5 ft wide.

RESTRICTED

POWER REQUIREMENTS

220 V d.c. - 20 amps (60 amps peak)
24 V d.c. - 20 amps (inc. 5 amps for stabilisers)
200 V 1100 Hz 1 phase - 5 amps (inc. supply to the 200/20 V transformer in Distribution Board)
20 V 1100 Hz 1 phase - 7 amps (from the 200/20 V transformer in Distribution Board)
120 V 333 Hz 3 phase - 2.4 amps (13.6 amps for first 4 minutes)
50 V 50 Hz 3 phase - 5 amps

HANDBOOK

BR 2107(1)(2)(3)

ESTABLISHMENT LIST

E 854

INSTALLATION SPECIFICATION

B 671 (Key Diagrams)
B 673 (Aerial Outfit AQT)

RESTRICTED

RESTRICTEDBR 333(1)
Original**AERIAL OUTFIT AZR****AZR****SUMMARY OF DATA****PURPOSE**

For use with Radar Type 278 to provide target elevation information for the Glamorgan Weapon System (G.A.W.S.).

BEAM WIDTH

4.5° Horizontal }
2.5° Vertical } To half field strength

BRIEF DESCRIPTION

The aerial consists of a cut paraboloid reflector for combined transmission and reception. The reflector can be elevated and trained in either direction by manual control from the Aerial Control Cabinet or by auto control from the Action Data Automation (ADA) System. Stabilisation against roll and pitch is provided by level and cross level training correction signals applied to the elevation and training servos respectively.

MAJOR UNITS

5985-AP 186554	Pedestal Unit
5985-AP 186560	Cabinet Aerial Control (Framework only)
6110-99-570-2001	Amplifier Assembly MK117AA
6110-99-570-2002	Amplifier Assembly MK122AA

**PHYSICAL DATA**

Pedestal Unit (including reflector unit)	Height 12 ft 9 in Turning Circle 4 ft 9 in (Radius) Weight 2900 lb			
	Height	Width	Depth	Weight
Reflector Unit	8 ft 6 in	6 ft	—	170 lb
Pedestal, Aerial	—	—	—	2330 lb
Aerial Control Cabinet	4 ft 2 in	2 ft	2 ft 9 in	408 lb empty 713 lb with units
Height including shock mounts and terminal chamber 6 ft 3 in				
Amplifier Assembly MK117AA	2 ft 8 in	1 ft 5½ in	1 ft 5¾ in	196 lb
Amplifier Assembly MK122AA	1 ft 1 in	1 ft 5¾ in	1 ft 4½ in	108 lb

POWER REQUIREMENTS

115 V 400 Hz single-phase
115 V 60 Hz single-phase
220 V d.c.
230 V 60 Hz three-phase
24 V d.c.

HANDBOOK

BR 2459

ESTABLISHMENT LIST

E 1400

INSTALLATION SPECIFICATION

B 870

RESTRICTED

RESTRICTEDBR 333(1)
OriginalS E C T I O N 9CONTENTS LIST

Battery Charging Equipment for Frequency
Standard Outfits FSA, FSC, 6130-99-519-1625 (Cabinet)

Data Retransmission Outfit TRA
Data Retransmission Outfit TRB
Data Retransmission Outfit TRD/E/F (To be issued later)

Test Set, R.F. 5895-99-972-5265, for
a FST Teleprinter System

Interference Suppression Outfit RIS(6)

Clock, Direct Reading, 6645-99-972-5270

Recording Control and Distributing Outfit RDA

Digital Coder, Optical (To be issued later)

Test Set, Antenna

Maintenance Annex Outfit RMN (2)

Radar Maintenance Room Outfit RMO (To be issued later)

RESTRICTED

RESTRICTEDBR 333(1)
Original**BATTERY CHARGING EQUIPMENT FOR FREQUENCY
STANDARD OUTFITS FSA, FSC****FSA
FSC****SUMMARY OF DATA****PURPOSE**

The Cabinet, Electrical Equipment is designed to house two Chargers-Battery, each consisting of 21 nickel-cadmium alkaline cells with provision for cycling the cells alternately on charge and discharge.

BRIEF DESCRIPTION

The Cabinet, Electrical Equipment has two separate mains supplies; one for the anti-condensation heaters and the other for the two battery chargers. Mains availability is indicated by two neon lamps on the top of the cabinet. Facilities for a remote alarm circuit in parallel to each charger-battery is incorporated.

Each charger-battery accommodates 21 nickel-cadmium cells, NSN 6135-99-850-9846 (Sonotone Type S193, size D) and provides charge/discharge facilities.

The constant-current charging circuit ensures that the total circuit impedance, and therefore the charging rate, remains constant irrespective of the state of the cells being charged..

A discharge cut-out circuit is provided during the discharge cycle to initiate an alarm sequence on falling to a pre-determined voltage. A monitoring facility is provided to check the condition of individual cells on load.

MAJOR UNITS

NSN 6130-99-519-1625, Cabinet, Electrical Equipment.
NSN 6130-99-519-1624, Charger-Battery (1)
NSN 4540-99-580-1646, Heating Element.

PHYSICAL DATA

	Height	width	Length	Weight
Cabinet, Electrical Equipment	31- in	22-9/16 in	21½ in	145 lb
Charger-Battery (1)		17 in	15 in	42 lb
Charger-Battery (2)		17 in	15 in	42 lb

POWER REQUIREMENTS

115 V or 230 V single phase, 50 Hz, 30 W.

HEAT DISSIPATION

30 W per charger-battery

HANDBOOK

BR 2460

ESTABLISHMENT LIST

E 1420

INSTALLATION SPECIFICATION

919 PRE, Vol. 1. APP. A.

RESTRICTED

RESTRICTEDBR 333(1)
Original**DATA RETRANSMISSION OUTFIT TRA****TRA****SUMMARY OF DATA****PURPOSE**

To receive an output from a single magslip of 360° sector value and to retransmit this received information on up to eight magslips, also of 360° sector value.

BRIEF DESCRIPTION

The Data Bearing Retransmitter is a servo operated unit which accepts a single coarse transmission of bearing data and can provide eight retransmission channels. Driven by the Control Amplifier it operates one 115 V 60 Hz, and six 115 V 400 Hz magslip transmitters with provision for the addition of one further 2 inch or 3 inch magslip.

Accuracy of following is of the order of 2.5 minutes of arc per rev/min.

The manufacturing limit of backlash is:-

Resetter to four magslips on anti-backlash
Cluster - 4 minutes of arc
Resetter to remaining magslips - 7½ minutes of arc.

MAJOR UNITS

NSN 5990-99-972-9397, Retransmitter, Data Bearing
NSN 6110-99-972-9398, Control Amplifier

PHYSICAL DATA

	Height	Width	Depth	Weight
Retransmission Unit	16½ in	15 in	11½ in (approx)	71 lb
Control Amplifier	11½ in	11 in (approx)	5½ in (approx)	20 lb (approx)

POWER REQUIREMENTS

Retransmitter 115 V 400 Hz single phase a.c. - 0.5A per transmitter magslip
115 V 60 Hz 0.5A per transmitter magslip

Control Amplifier 115 V 400 Hz 35 watts

HANDBOOK

BR 2367

ESTABLISHMENT LIST

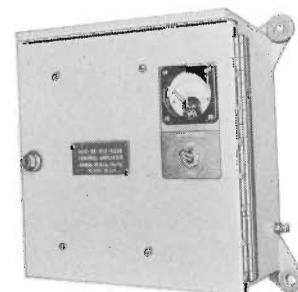
E 1355

INSTALLATION SPECIFICATION

B922



RETRANSMITTER DATA BEARING



CONTROL AMPLIFIER

RESTRICTED

RESTRICTEDBR 333(1)
Original**DATA RETRANSMISSION OUTFIT TRB****TRB****SUMMARY OF DATA****PURPOSE**

To receive COARSE (360°) or FINE (40°) Magslip inputs and to transmit this receiver information as a COARSE/FINE or COARSE synchro output.

BRIEF DESCRIPTION

The Retransmitter Data Synchro is an a.c. servo operated unit, which accepts COARSE/FINE transmissions of data and can provide the following retransmission channels:-

- (a) Six Control Transmitters } 360° Sector Value
Three Torque Transmitters }
- (b) Four Control Differential Transmitters - $360^{\circ}/40^{\circ}$ Sector Value
Seven Control Differential Transmitters - 360° Sector Value.

MAJOR UNITS

5895-99-971-8064 - Retransmitter Data Synchro
6110-99-971-8520 - Control Amplifier

PHYSICAL DATA

	Height	width	Depth	Weight
Retransmitter Data Synchro	16 in	36 in	15 in	186 lb
Control Amplifier	10 in	5 in	9½ in	25 lb (approx)

POWER REQUIREMENTS

Retransmitters - 115 V 400 Hz single phase a.c. -0.5A per transmitter.
115 V 60 Hz single phase a.c. -0.5A per transmitter.

Retransmitter - 115 V 400 Hz 250 watts

Anti-Condensation Heaters 115 V, 60 Hz, 30 watts

Fan - 115 V, 60 Hz, 30 watts.

HANDBOOK

BR 2367

ESTABLISHMENT LIST

E1417

INSTALLATION SPECIFICATION

B960 Volume 5.

RESTRICTED

RESTRICTEDBR 333(1)
Original**TEST SET, RADIO FREQUENCY****NSN 5895-99-972-5265****SUMMARY OF DATA****PURPOSE**

A fully transistorised VLF/LF Test Set suitable for overall functional testing of a F.S.T. Teleprinter System.

BRIEF DESCRIPTION

5895-99-972-5265 Test Set R.F. is a portable signal generator consisting of an oscillator which can be switched to either one of two spot frequencies, one at 17.225 kHz and one of 80 kHz. The oscillator frequencies are frequency modulated by feeding into the Test Set the output from a Telegraph Transmitter Distortion Measuring Set (CT473). The frequency deviation is nominally ± 25 Hz on 17.225 kHz and ± 42.5 Hz on 80 kHz. The nominal 4 volt p-to-p output can be attenuated to a maximum 110 dB in 1 dB steps.

PHYSICAL DATA

Height	Depth	Width	Weight
12 in	22 in	8½ in	24 lb

POWER REQUIREMENTS

115 V, 230 V, 240 V, 50-60 Hz.

HANDBOOK

BR 2426

ESTABLISHMENT LIST

No separate Establishment List, usually part of Terminal Outfit

INSTALLATION SPECIFICATION

No separate Installation Specification



TEST SET RADIO FREQUENCY
5895-99-972-5265

RESTRICTED

OUTFIT RIS(6)

RIS(6)

SUMMARY OF DATA

PURPOSE

Outfit RIS(6) assists in the suppression of interference in Receiver Outfit CUJ and D.F. Outfit FU1 due to Radar Type 965/M.

BRIEF DESCRIPTION

The Outfit comprises a Drive Unit and a Suppressor Unit, Pulsed, the latter item being fitted inside the receiver. Also associated with the Outfit, but part of Type 965/M, is AP 164232 Trigger Unit. A 6.08 kHz sine wave output from the Trigger Unit is applied to the Drive Unit which amplifies it and contains a phase changing network giving a continuously variable 360° phase change between input and output. The Drive Unit output feeds the suppressor unit which generates a blanking pulse to desensitise the receiver i.f. amplifier for the duration of the radar transmitter pulse. The system provides protection of at least 70 dB; interference levels of up to 9.1 V at the receiver aerial being suppressed without degrading the receiver performance to any noticeable extent. Up to 20 receivers, each fitted with a Suppressor Unit, may be fed from one Drive Unit.



5895-99-418-1876 Drive Unit

ELECTRICAL CHARACTERISTICS

Frequency of Blanking Pulse 6.08 kHz

Duration of Blanking Pulse 18 μ s

Interference Pulses 380 p.p.s. at 3.8 μ s duration

A facility is also provided for operation with a pulse duration of 10 μ s at a p.r.f. of 190 p.p.s.

Temperature Range -25°C to $+55^\circ\text{C}$ ambient.

MAJOR UNITS

Item	Part. No.	Description	Physical Data			
			Height	Width	Depth	Weight
1	5895-99-418-1876	Drive Unit	11½ in	8½ in	9 in	22 lb
2	415-1168	Amplifier A.F. (2-stage)				
3	415-1169	Amplifier A.F.				
4	415-1170	Stabiliser, voltage	2½ in	3⅝ in	5½ in	1½ lb
5	418-1779	Suppressor Unit, Pulsed				

NOTE: Items 2, 3 and 4 are contained in item 1.

POWER REQUIREMENTS

418-1876 Drive Unit

115/230 V a.c. 1 ϕ 45-65 Hz 35 W.

418-1779 Suppressor Unit, Pulsed

255 V d.c. 15 mA

48 V d.c. 12 mA

6.3 V a.c. 0.45A

} Derived from Receiver Power Supplies.

HANDBOOK

BR 2318

ESTABLISHMENT LIST

E1251

INSTALLATION SPECIFICATION

Addenda to 8865, 8877.

6645-99-972-5270
CLOCK, DIRECT READING

SUMMARY OF DATA



PURPOSE

A fully transistorised digital clock which may be driven from a standard frequency source to provide accurate time indication in hours, minutes, seconds and quarter seconds.

BRIEF DESCRIPTION

6645-99-972-5270 Clock, Direct Reading is a rack mounted unit designed to convert a 100 kHz signal, obtained from a standard frequency source, into a 1 kHz signal capable of driving a synchronous motor. Suitable gear trains enable the motor to drive a cyclometer read-out clock calibrated in hours, minutes, seconds and quarter seconds. The accuracy of the clock is dependent on the accuracy of the input signal. In addition to the digital read-out the equipment also provides a 1 kHz output at 12.7 V r.m.s. and a 1 kHz sine wave output with a duration of 100 ms at a p.r.f. of one second.

PHYSICAL DATA

Height	Depth	Width	Weight
5½ in	11½ in	19 in	30 lb

POWER REQUIREMENTS

115 V, 230 V, 240 V, 50-60 Hz.
100 kHz standard frequency
Heat dissipation less than 100 W

HANDBOOK

BR 2425

ESTABLISHMENT LIST

No separate 'E' List, usually part of FSA(4)

INSTALLATION SPECIFICATION

No separate installation Specification

RECORDING CONTROL AND DISTRIBUTING OUTFIT RDA

RDA

SUMMARY OF DATA

PURPOSE

The Recording Control and Distributing Outfit RDA is intended for the switching, fusing and distribution of the power supplies to, and the operational switching and control of, the trials recording equipment fitted in the HAMPSHIRE-class guided-missile destroyers (DLG).

BRIEF DESCRIPTION

The Recording Power Distribution Cabinet contains switches, indicating lamp and fuses associated with the distribution of the power supplies to the recording equipment. The Recording Control Cabinet contains intercom equipment, a 30 channel fixed-pen event recorder, and switches and indicating lamps for the remote control of the recording equipment. In addition, 1 pulse per second timing signals and identification signals are distributed from the R.C.C. to the recording equipment.

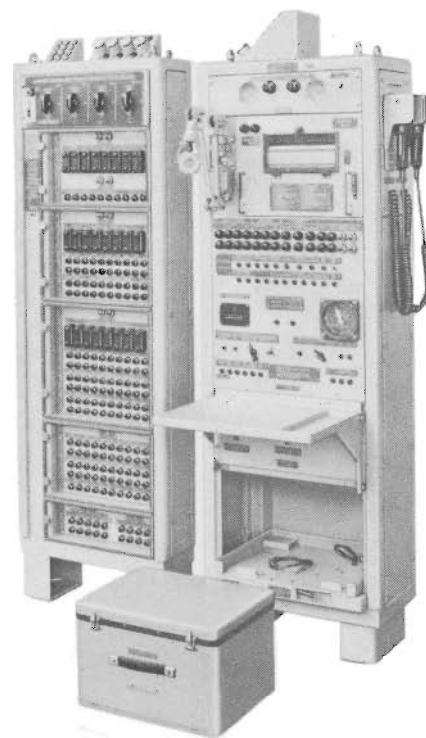
POWER REQUIREMENTS

Recording Control Cabinet

24 V d.c. 10 amp (maximum)
115 V 60 Hz 1 phase 1.5 amp
115 V 60 Hz 1 phase 0.4 amp (Conditioning heaters)
220 V d.c. 9.5 amp (approximately)
420 V d.c. 120 mA (maximum)

Recording Power Distributing Cabinet

indicator lamps only.



RECORDING CONTROL AND DISTRIBUTING
OUTFIT RDA

HEAT DISSIPATION

300 W maximum.

MAJOR UNITS AND PHYSICAL DATA

PATTERN NUMBER	DESCRIPTION	HEIGHT	WIDTH	DEPTH	WEIGHT (LB)
1430-S 700051	Cabinet, Recording, Power Distribution	5 ft 3 in	1 ft 10 in	8 in	275 (approx)
1430-S 700052	Cabinet, Recording Control	5 ft 3 in	1 ft 10 in	1 ft	325 (approx)
1430-S 700053	Recorder, Event, Drive Unit				(Less tape-recorder)

NOTE: A Recording Outfit REH(3) is required with this equipment.

HANDBOOK

BR 2327

ESTABLISHMENT LIST

None. Spares are listed in BR 226.

INSTALLATION SPECIFICATION

M 5145/601X3. Appendix E

TEST SET, ANTENNA 5895-99-519-8575

SUMMARY OF DATA

PURPOSE

To check the serviceability of the antenna assemblies used in Aerial Outfits ALK(3), ALM, ALO, ALP, ALY and ALZ.

BRIEF DESCRIPTION

Test set used to check:

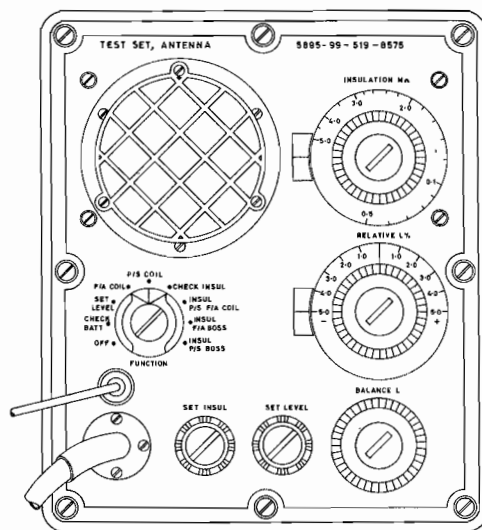
1. Relative Inductance of the P/S and F/A Coils in the antenna assemblies.
2. Dynamic Impedance of the Antenna Coils.
3. Insulation Resistance between Coils and gland boss.

ACCURACY

- | | |
|-----------------------|---|
| Relative Inductance | - better than $\pm 25\%$ |
| Dynamic Impedance | - better than $\pm 15\%$, eg a mid scale meter indication is 175 kohm $\pm 15\%$ |
| Insulation Resistance | - over range 0.5 to 5 Mohm to an accuracy of $\pm 20\%$ |

HANDBOOK

BR 2452



LOCAL MAINTENANCE ANNEXE OUTFIT RMN(2)

RMN(2)

SUMMARY OF DATA

PURPOSE

Local Maintenance Annex Outfit RMN(2) provides testing facilities for the electronic sub-units of Display Outfits JW(1), JW(2), and JYB. Provision is made to operate the units under conditions similar to those found in actual service.

POWER REQUIREMENTS AND CONSUMPTION

115 V, 220/225/230 V, or 440 V \pm 5%, 50-60 Hz single phase, 650 W
 120 V, 500 Hz single phase Aerial Ref. Voltage.
 115 V, 400 Hz single phase Simulator Supply.

HEAT DISSIPATION

600 W Approximately (including power supply unit).

BRIEF DESCRIPTION

Outfit RMN(2) comprises a metal cabinet divided into compartments to house the various sub-units, and a power supply unit to provide the necessary d.c. voltages. Four range scales are available: 20 and 60 nautical miles, for use with units of Display Outfits JYB and JW(2); 60 and 180 nautical miles for use with units of Display Outfit JW(1). Facilities are provided for selection of signal inputs from the following sources:

- (a) A plug-in radar simulator unit.
- (b) Three external radars.
- (c) Internally generated test signals (JW(1) only).

The signals appear on a rotating trace on a projection-type c.r.t., which, since it must be viewed directly, is provided with a special lead-glass filter.

MAJOR UNITS

Rack, Electrical Equipment NSN 6625-99-520-5194 which includes:

AP 106552 Control Indicator (Right) Unit 684
 AP 106080 Control Panel (Left) Unit 683
 AP 101718 Heater Transformer Unit 626
 NSN 5895-99-520-3018 Cabinet, Electrical Equipment (for Simulator Unit)

The following units can be housed in the rack:

AP 101713 Power Supply Unit SGD 101/01
 AP 101702 Servo Amplifier Unit 504 (JW(1), JW(2), JYB)
 AP 101705 Time Base Unit 514 (JW(1), JW(2), JYB)
 AP 101701 Calibrator (Range Marker) Unit 503 (JW(1), JW(2), JYB)
 AP 101703 25 kV E.H.T. Unit 508 (JW(1), JW(2), JYB)
 AP 101706 Smoothing Unit 516 (JW(1), JW(2), JYB)
 AP 105222 Video Amplifier Unit 911 (JW(2), JYB)
 or
 AP 101704 Video Amplifier Unit 513 (JW(1))
 AP 101708 Cathode Ray Tube Unit 552 (JW(1), JW(2))
 or
 AP 105221 Cathode Ray Tube Unit 910 (JYB)
 AP 105223 Brilliance Control Unit 912 (JW(2), JYB)
 or
 AP 101707 Brilliance Control and Test Time Base Unit 517 (JW(1))
 NSN 5840-99-522-1504 Simulator

Also included in Outfit RMN(2) are:

AP 172730 Oscillator (Ship's Head Marker) Unit 915
 Box of Tools (Special) 5840-AP 103729
 Lead Set, Test NSN 6625-99-520-5199

PHYSICAL DATA

Height	Width	Depth	Weight (with sub-units)
54 in	48 in	36 in	550 lb
(137.2 cm)	(121.9 cm)	(Desk Open) (91.4 cm)	(249.48 kg)

RESTRICTED

HANDBOOK

BR 4139

ESTABLISHMENT LIST

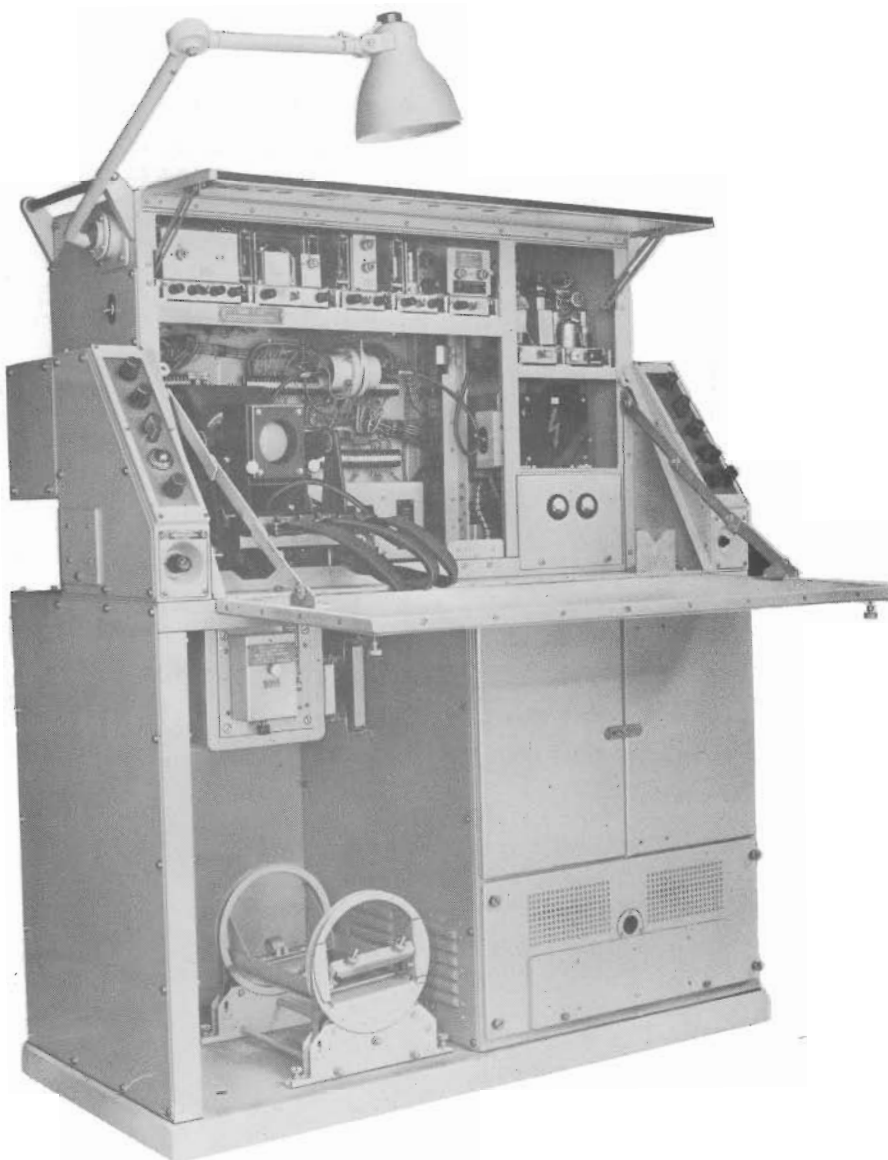
E 1429

INSTALLATION SPECIFICATION

B772/R1

MAINTENANCE SCHEDULE

R5/8

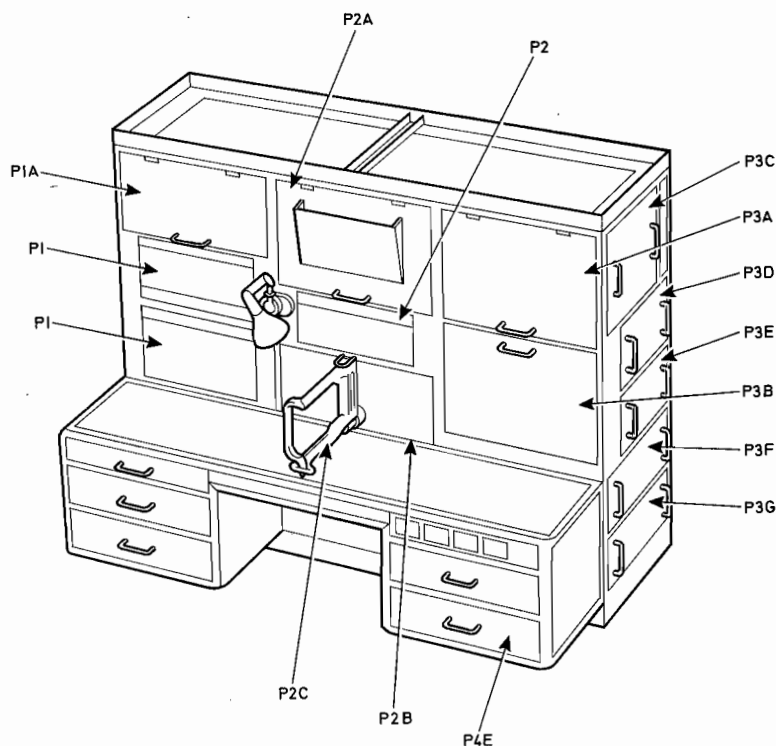


RESTRICTED

RADAR MAINTENANCE OUTFIT RMO

RMO

SUMMARY OF DATA



RADAR MAINTENANCE OUTFIT

PURPOSE

The Radar Maintenance Outfit provides a selection of power supplies, signals and monitoring facilities for testing the majority of portable units used in Radar Type 909.

BRIEF DESCRIPTION

The Radar Maintenance Outfit comprises three upright cabinets and a maintenance table. A rotatable printed wiring board holder protrudes over the table and Type 909 boards under test are placed in the holder. Built in test equipment comprises an oscilloscope, a frequency counter timer and an integrating digital voltmeter. Soldering iron, standard power sockets and special portable test equipment are also provided.

MAJOR UNITS

P1	Integrating Digital Voltmeter	
P1	Counter Electrical Frequency	6625-99-971-8519
P1A	Rack Electrical Equipment	5975-99-519-6092
P2	CT536A Oscilloscope Double Beam	
P2A	Rack Electrical Equipment	5975-99-519-6091
P2B	Panel Signal Distribution	6625-99-520-0194
P2C	Holder Adaptor Test	6625-99-520-0193
P3A	Panel Monitor	1430-99-520-0197
P3B	Panel Power Distribution	6110-99-520-0161
P3C	Panel Power Distribution	6110-99-924-8320
P3D	Power Supply	6130-99-519-6145
P3E	Power Supply	6130-99-519-6146
P3F	Power Supply	6130-99-519-6147
P3G	Power Supply	6130-99-519-6148
P4E	Test Set Multirange No 1	6625-99-105-7049

POWER REQUIREMENTS

440 V, 60 Hz, 3 phase
200 V, 600 Hz, 3 phase
115 V, 60 Hz.
115 V, 400 Hz.

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PHYSICAL DATA

Weight of equipment. 0.8 tons
Dimensions of equipment 6 ft 9 in long by 3 ft 6 in wide by 6 ft 3 in high.
When dismantled into its four major assemblies the outfit will pass through a 2 ft 6 in square hatchway.

HANDBOOK

BR 2948.

ESTABLISHMENT LIST

S1530.

INSTALLATION SPECIFICATION

B1045.

RESTRICTED