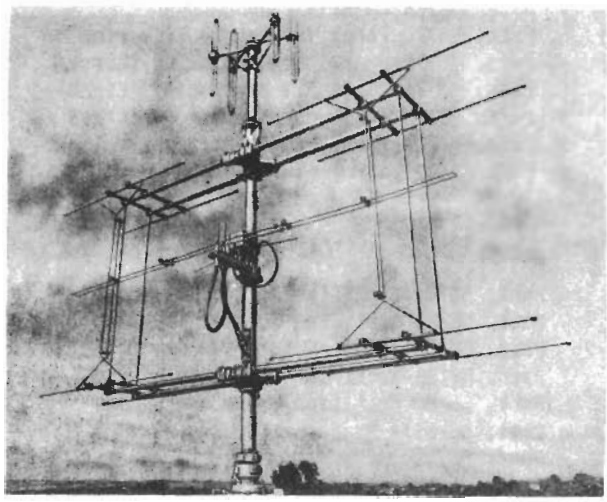
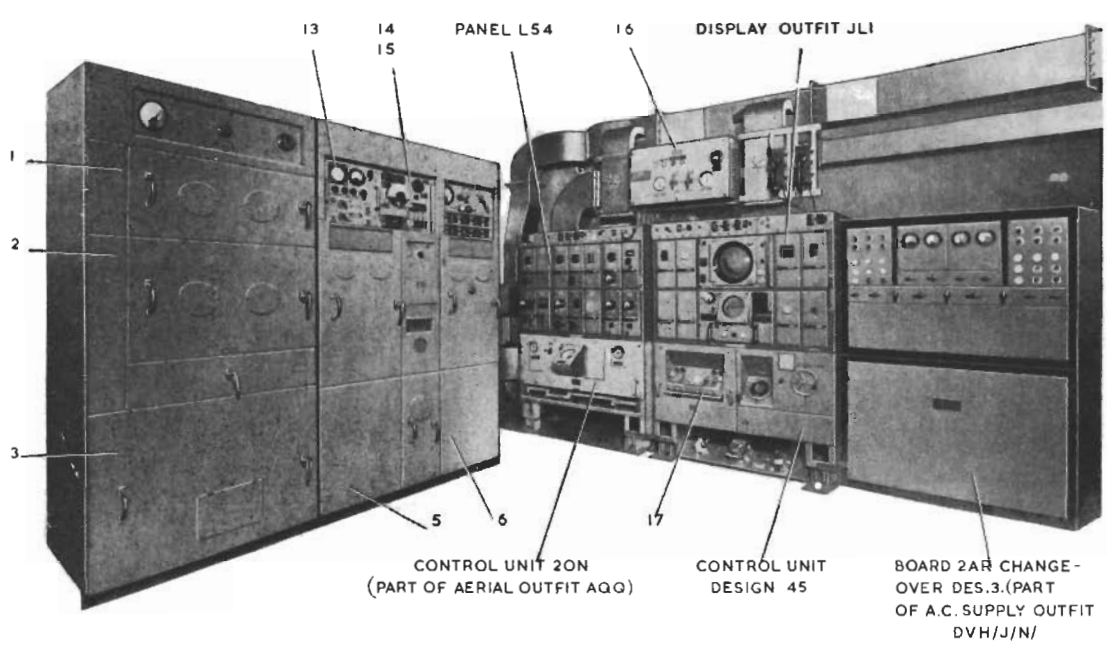
TYPE 960
SUMMARY OF DATA

PURPOSE	Aircraft Warning and Height Estimation.
FREQUENCY	86 Mc/s, 88 Mc/s or 90 Mc/s (spot frequencies).
WAVELENGTH	3.5, 3.4 or 3.3 metres (approx.)
POWER OUTPUT	450 kW.
PULSE REPETITION FREQUENCY	250 pulses per second.
PULSE LENGTH	5 and 15 microseconds
BEAM-WIDTH	35° horizontal
AERIAL ROTATION SPEED	0-7 revs per minute clockwise 0-2 revs per minute anticlockwise
INTERMEDIATE FREQUENCY	8 Mc/s
RECEIVER BANDWIDTHS	(i) 65 kc/s for 15 μs (long) pulse (ii) 500 kc/s for 5 μs (short) pulse For group counting, bandwidth of 500 kc/s for 15 μs pulse is used.
POWER REQUIREMENTS AND CONSUMPTION	180V 500 c/s 3.5 kW 120/360V 250 c/s 7.5 kW 230V 50 c/s single phase 2¼ kW 50V 50 c/s single phase 0.2 kW 220V D.C. 10¼ kW 22V D.C. 0.15 kW Gyro supplies to 4 - Patt. 9298 Motors.
HEAT DISSIPATION	Modulator and transmitter - 6¼ kW Receiver - 800 watts U.D.U. - 1 kW



AERIAL OUTFIT AQQ



VIEW OF A TYPE 960 OFFICE

MAJOR UNITS

(a) Transmitter and Modulator (Panel 3BT)

1. Patt. 58771 Panel 3BT Oscillating
2. Patt. 58772 Panel 3BT Amplifying
3. Patt. 58773 Panel 3BT Output
4. Patt. 58774 Panel 3BT Supply Filtering
5. Patt. 58775 Panel 3BT Modulating (Left)
6. Patt. 58776 Panel 3BT Modulating (Right)
7. Patt. 58777 Framework, Sprung, 6 ft x 3 ft
8. Patt. 58778 Air Duct Outlet for Panel 3BT
9. Patt. 58779 Air Duct Inlet for Panel 3BT

Important Sub-Units

10. Patt. 58811 & 59194 T/R Switch and Aerial Filter (in 3)
11. Patt. 58812 Voltage Control and Trigger Unit (in 6)
12. Patt. 58813 Dummy Load, Design 9 (in 8)
13. Patt. 55833 Wavemonitor G301 (in 5)
14. Patt. W881 Wavemeter G69 (in 5)
15. Patt. W879 Supply Unit for G69 (in 5)
16. Patt. 65785 Board Watchkeeping Design 2
17. Patt. 58770 Trigger Unit Design 4

(b) Receiver

Patt. 58781/A Panel L54 (Receiving) consisting of:-

Patt. 58782 Amplifier Unit I.F. Design 8
Patt. 58783 Amplifier Unit I.F. Design 9
Patt. 58784 Filter-Unit (Video)
Patt. 58785 Rectifier Unit, Design 100
Patt. 58786 Rectifier Unit, Design 101
Patt. 58787/A Range Calibrator, Design 3
Patt. 58788 Performance Meter, Design o
Patt. 58789 Amplifier Unit, R.F. Design 8
Patt. 58790 Auto Frequency Control Unit
Patt. 58791 Rectifier Unit, Design 102
Patt. 58792 Rectifier Unit, Design 103 (2 in No.)
Patt. 58793 Amplifier Unit (Power Video)
Patt. 58794 Cathode Follower Unit, Design 13
Patt. 58796 Switch-Unit, Design 31
Patt. 58797 Switch-Unit, Design 32
Patt. 58798 Switch-Unit, Design 33

(c) Aerial Outfit AQQ

Containing (i) Patt. 57604 Control Unit 20N
(ii) Patt. 57692 Pedestal Unit 19AL
(iii) Amplidyne Generator Set consisting of Patt. 59376 Motor Generator Servo and Patt. 65293 Contactor Unit Des. 8
(See separate data sheet)

(d) Frequency Control Units

Patt. 58670	Control Unit, Design 45 local frequency	
Patt. 59708	Control Unit, Design 44 (Fitted in R.D.R. for remote control in Type 960/982 Ships)	Part of A.I.C. Outfit PDA
Patt. 59709	Control Unit, Design 46 (Fitted in R.D.R. for remote control in Type 960/277 Ships)	Part of A.I.C. Outfits PDB/C

ASSOCIATED POWER SUPPLY OUTFIT

A.C. Supply Outfits DVH or DVJ or DVN. (see separate data sheets)

ASSOCIATED INTERROGATORS AND TRANSPONDERS

(i) Type 940 (ii) Type 242P or 242Q (iii) Type 253Q

PHYSICAL DATA

Weight of office equipment (inclusive of power supply control and distribution panels) - 57 cwt.
Weight of Amplidyne Set and Contactor (close to office) - 3 cwt.
Weight of Aerial Outfit AQQ and Pedestal 19AL - 13 cwt.
Dimensions of typical office - 14' 6" x 11' (exclusive of stiffeners, lagging etc.)

BRIEF DESCRIPTION

A long range aircraft warning set fitted in cruisers and above, as a replacement of the Type 281 series. Type 960 is normally fitted either in conjunction with Type 277 and 293 or with Types 982, 983 and 293. It employs the following displays in various positions - Display Outfit JE (P.P.I.) Display Outfit JL1 and JM1 (U.D.U.) Display Outfit JK (Skiatron) and Display Outfit JN (Azicator). G-band interrogation is provided by Type 940 and normal interrogation by Types 242P or Q. Where fitted in conjunction with Type 277 and 293 Action Information Centre Outfit PDB is fitted with the various remote displays and where fitted with Types 982, 983, 293 A.I.C. Outfit PDA is fitted.

REMARKS

The maximum length of the aerial cable from the Type 960 office to the Aerial Outfit AQQ should not under any circumstances exceed 160 feet.

HANDBOOKS

B.R.1774(1)(2)(3) (960) B.R.1867 (AQQ)

ESTABLISHMENT LISTS

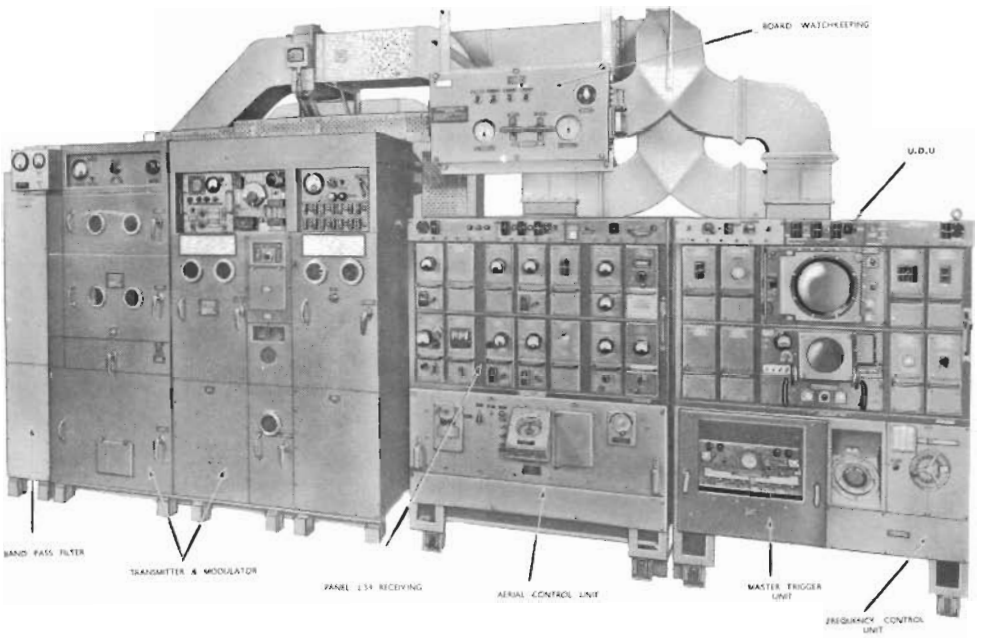
E.850 (960) E.851 (AQQ) E.852 (JL & JM)
E.919 (PDA & PDB)

INSTALLATION SPECIFICATIONS

B.640 (960) B.527 (AQQ)
B.556 (JL & JM) B.699 (PDA)

TYPE 960 960

SUMMARY OF DATA



TYPE 960 GENERAL VIEW OF OFFICE EQUIPMENT

PURPOSE

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 μs)
(b) 500 kHz for short pulse (5 μs)

MAJOR UNITS

(a) Transmitter and Modulator (panel 3 BT)

1. AP 58771A Panel 3 BT Oscillating
2. AP 58772A Panel 3 BT Amplifying
3. AP 58773A Panel 3 BT Output
4. AP 58774 Panel 3 BT Supply Filtering
5. AP 58775A Panel 3 BT Modulating Left
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
2. AP 62861A Meter Unit Des. 21
   or
   5340-AP 172339 Automatic Protection Unit
3. AP 58670 Control Unit Des. 45 (Local Frequency)
4. AP 58779 Trigger Unit Des. 4 (Master Trigger Unit)
5. AP 65785A Board, Watchkeeping, Des. 2 (d.c. ships)
   or
   AP 61530 Board, Watchkeeping, Des. 3 (a.c. ships)
6. AP 58680 Board 2AR Distributing Des. 1
   or
   AP 68669 Board Distributing Des. 8
7. AP 58780 Switch Unit Local/Remote
8. AP 65644 Rack, Stowage Des. 13 (for spares)

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

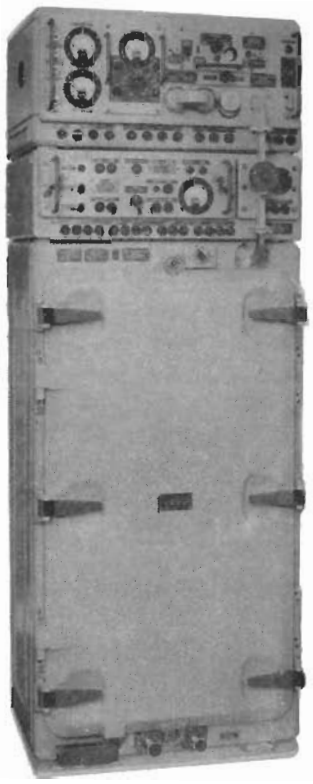
TYPE 963 TRANSMITTER AND RECEIVER

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.



TRANSMITTER AND RECEIVER

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

RECEIVER SENSITIVITY

9 μwatts 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 ± 1 MHz

INTERMEDIATE FREQUENCY

30 MHz ± 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:	62300
Cabinet, Design 103, transmitter	62301
Sub Modulator Chassis	62304
Control Unit, Design 99, Transmitter	62307
Rectifier Chassis, 63CP, Alarm	62676
2. The following are associated with AP 62300, and are first-fitting items:	
Transmitter Chassis, 69C	62305
Rectifier Chassis, 63CA, Transmitter	62306

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 lb
CABINET ASSEMBLY, DESIGN 79, RECEIVER	120 lb

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. or 440 V, 60 Hz, single-phase	:	anti-condensation heaters in d.c. ships

CONSUMPTION

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

AERIAL SYSTEM

Aerial Outfit AKN

HANDBOOK

BR 1557

ESTABLISHMENT LIST

E 1138

INSTALLATION SPECIFICATION

B 8440