



BR 575(2)F

AUDIO FREQUENCY EQUIPMENT

AF 100 SERIES

BROADCAST SYSTEMS

CONTROL BOXES

SUPERSEDES BR 575(2)F, 1953

THIS BOOK IS THE PROPERTY OF H M GOVERNMENT

BR 575(2)F

AUDIO FREQUENCY EQUIPMENT

AF 100 SERIES

BROADCAST SYSTEMS

CONTROL BOXES

SUPERSEDES BR 575(2)F, 1953

By Command of the Defence Council

AUGUST 1966

J. T. Dunnett

**MINISTRY OF DEFENCE
SHIP DEPARTMENT**

N/S 26621/66

BR 57512P

AUDIO FREQUENCY EQUIPMENT

AF 111111

BROADCAST SYSTEM

CONTROL CIRCuits

CONTROL CIRCuits

Suggestions for improvement of the text or illustrations,
which can be incorporated in this book or in any future
revision of the book, will receive careful consideration;
they should be forwarded to the

Director General Ships, Ministry of Defence (Naval).

MINISTRY OF DEFENCE

THE GOVERNMENT

PRINTED BY

[illegible]

continued overleaf

[illegible]

AUDIO FREQUENCY EQUIPMENT

AF 100 SERIES BROADCAST SYSTEMS

CONTROL BOXES

<u>CONTENTS</u>	<u>Paras</u>
INTRODUCTION	1-5
DESCRIPTION	
EARLY CONTROL BOXES	6-8
SEVEN-WAY CONTROL BOX	9-10
Case	11-12
Cover	13
Top Plate	14-22
Microphone Switching	23-26
TWO-WAY CONTROL BOX	27-28
Microphone Switching	29
ONE-WAY CONTROL BOX	30-31
Case	32
Top Plate	33-34
Microphone Switching	35
KEY SWITCHES, ROTARY, PATT. 0512/12678 AND PATT. 0558/198388	36
Key, Rotary, Patt. 0558/198388	37-43
Key, Rotary, Patt. 0512/12678	44
KEY SWITCH, PLUNGER, PATT. 0558/198389	45
MAINTENANCE	46-49

COMPONENTS LIST

<u>ILLUSTRATIONS</u>	<u>Figure</u>
Control Box, Patt. 0558/198385	1
Control Box, Patt. 0558/198386	2
Control Box, Patt. 0558/198387	3
Key Switches (Rotary and Plunger)	4

AUDIO FREQUENCY EQUIPMENT

AF 100 SERIES BROADCAST SYSTEMS

CONTROL BOXES

INTRODUCTION

1. In broadcast systems of the AF100 Series, means must be provided at the control positions for the user to gain access to the system and to select the part or parts of the system to which he wishes to broadcast.
2. Several patterns of Control Box are provided to satisfy this requirement but at some control positions alternative equipment is provided. This alternative equipment is described in the appropriate books of this series.
3. The patterns of Control Box in use are:-
 - (a) Control Box, broadcast of intercom, (large) incomplete, Patt. 0512/12648.
 - (b) Control Box, broadcast or intercom, (small) incomplete, Patt. 0512/12650.
 - (c) Control Box, broadcast, seven-way, Patt. 0558/198385.
 - (d) Control Box, broadcast, two-way, Patt. 0558/198386.
 - (e) Control Box, broadcast, one-way, Patt. 0558/198387.
4. Each control box provides:
 - (a) Microphone stowage.
 - (b) Volume meter.
 - (c) Key or keys to switch relay energising circuits for the selection of loudspeaker groups, etc.
5. Other equipment such as call lamps and buzzers is fitted in some patterns of box.

DESCRIPTION

EARLY CONTROL BOXES

6. The early control boxes Patt. 0512/12648 and Patt. 0512/12650 are incomplete boxes that are fitted out and wired as necessary to suit specific applications to AF100 Systems. Each complete box has a reference letter suffixed to the pattern number.

The patterns used and their applications are:

Patt. 0512/12648 (ref. a)	AF 101, General Broadcast
Patt. 0512/12648 (ref. b)	AF 101, General Broadcast but without alarm and warning pushes
Patt. 0512/12648 (ref. c)	AF 125, Flight Deck Broadcast (two-hangar systems)
Patt. 0512/12648 (ref. d)	AF 141, Machinery Intercom, steering machinery unit intercom (five position)
Patt. 0512/12648 (ref. e)	AF 141, Machinery Intercom, "A" machinery unit intercom
Patt. 0512/12648 (ref. f)	AF 141, Machinery Intercom, "X" machinery unit intercom
Patt. 0512/12648 (ref. g)	AF 141, Machinery Intercom, "B" machinery unit intercom
Patt. 0512/12648 (ref. h)	AF 141, Machinery Intercom, "Y" machinery unit intercom
Patt. 0512/12648 (ref. j)	AF 126, Flight Deck Broadcast (one-hangar system)
Patt. 0512/12648 (ref. k)	AF 141, Machinery Intercom, machinery unit intercoms (six positions)
Patt. 0512/12648 (ref. l)	AF 141, Machinery Intercom, steering machinery unit intercom (four positions)
Patt. 0512/12650 (ref. a)	AF 125, AF 126, Hangar sub-sections
Patt. 0512/12650 (ref. b)	AF 131, AF 132, Machinery Broadcast

7. The control boxes identified by different suffix letters have different circuits. Each box is equipped and wired individually and no diagrams or explanations of circuits are contained in this book. Such diagrams and explanations as are required are contained in the appropriate books of this series. Details of the components that may be fitted to complete each box are contained in the Components List.

8. These series of boxes have been superseded by the seven-way and two-way control boxes to which they are very similar in appearance and construction.

SEVEN-WAY CONTROL BOX (Fig. 1)

9. The seven-way control box, Patt. 0558/198385, which supersedes control box, Patt. 0512/12648, is a complete box that fulfils all the known application requirements of the A. F. 100 system. In construction, both patterns of box are the same.

10. The box, designed for bulkhead mounting and weighing about 50lbs, comprises three principal parts - the case, the cover and the top plate. All are cast of aluminium alloy and the assembly is watertight to 1.5lb/sq. in whether the cover is closed or open. Lugs are cast on the case and on the cover to enable the box to be secured closed by a padlock.

Case

11. All cable entries to the control box are made through glands in the bottom of the case. Two 16-way terminal strips and one 6-way terminal strip are mounted in the case. There are two rubber gaskets of circular cross section inserted in grooves in the front flange of the case. These gaskets ensure that watertight joints are made between the case and the cover and between the case and the top plate.

12. Hinge brackets for the cover are cast on the bottom of the case. Hinge brackets for the top plate are secured by screws to the flange of the case.

Cover

13. The cover of the control box is hinged at the bottom and is secured by a cam-type clip operated by a handle. A limit stop and an adjustable friction device are embodied in the hinge to prevent damage if the cover is allowed to fall.

Top Plate

14. All the electrical components except the terminal grids are carried on the top plate which is a panel attached to the case by a hinge at the bottom and secured by screws near the edge.
15. The equipment carried on the top plate consists of:
- (a) Microphone.
 - (b) Meter.
 - (c) Call-up lamp and buzzer.
 - (d) 10 keys.
 - (e) Five in-use lamps.
 - (f) Three push switches.
 - (g) Door switch.
16. Microphone. A recess is cast in the top plate to provide a housing for the microphone which is carried on an extensible spring-actuated arm. The microphone is automatically brought forward to a convenient position as the cover is opened and automatically stowed away when the cover is closed. Details of the microphone Patt. 0512/12579, are contained in BR 575(5).
17. Volume meter. The volume meter, Patt. 0557/12655, is similar to that used in the AF 100 series amplifiers. The only difference between the two is in the scale marking. For control boxes the scale is divided into three sectors marked LOW, NORMAL and HIGH. The HIGH sector is red; the NORMAL sector is green. The microphone input should not be so high that the meter needle moves into the HIGH sector. Connections to the meter are made through rectifiers MR1 and MR2 and resistors R1 and R2 to give full wave rectification of the amplifier output. A variable resistor RV1 is connected in parallel with the meter to allow compensation for component tolerances. The meter has an internal resistance of 100 ohms and a f.s.d. of 1mA. There is no switching in the meter lines so that, in systems with more than one control box, all the meters are in parallel (each through its own rectifier). Thus, at any control box, the meter gives an indication

if the system is in use from another control position.

18. Call lamp and buzzer. The call lamp is connected direct to terminals on one of the terminal strips and the buzzer, which has a limiting resistor in series with it, is connected to the same terminals.
19. Keys. Each key is actuated, by a rotary movement of the operating handle. The handle of the microphone key is horizontal; the handles of all other keys are vertical. Three keys have engraved tallies; these are:-

- (a) Microphone key - engraved PRESS TO SPEAK and REMOTE.
- (b) Master key - engraved MASTER.
- (c) Dimmer key - engraved DIMMER.

The tallies for the other keys are engraved as required for the particular application of each control box. These seven keys may be used for one or other of the following:

- (a) Section selection.
 - (b) Loudspeaker group selection.
 - (c) Volume reduction.
 - (d) Transfer control.
20. In-use lamps. Each in-use lamp is sited adjacent to a key. An in-use lamp lights to warn that the section with which it is associated is being used from another access position and that the associated key should not be operated.

21. Push switches. The tallies for the push switches are engraved:

- (a) WARNING.
- (b) ALARM.
- (c) SECTION CALL.

22. Door switch. (Fig 4) A door switch (key switch plunger, Patt. 0558/198389) fitted at the bottom of the top plate is actuated by opening and closing the cover. When the cover is closed, it breaks the supply to the lamps, the keys and the terminal for the extension microphone switch. The supply is connected when the cover is opened.

Microphone Switching

23. The microphone key is arranged as a double-throw key. When the key is held to PRESS-TO-SPEAK, the microphone on the top plate is used. An extension microphone can be used if the microphone key is set to REMOTE. If it is desired to broadcast

to pre-determined sections, the appropriate keys can be set, including the microphone key, then the control box can be closed and the extension microphone used.

24. When the key is in the neutral position, contacts 4 and 5 are open to ensure both microphones are disconnected. When the key is set to either PRESS-TO-SPEAK or REMOTE, contacts 4 and 5 close to connect the microphone to the terminal grids.
25. In the PRESS-TO-SPEAK position, one pole (contacts 28 and 29) of the microphone key disconnects the local loudspeaker and another pole (contacts 9 and 10) extends the supply to the terminal grid.
26. In the REMOTE position one pole (contacts 1 and 2) of the microphone key short circuits one pole of the door switch so that the supply is extended to the keys and to the terminal grid; another pole (contacts 21 and 22) completes the extension microphone circuit to the terminal grid via contacts 4 and 5.

TWO-WAY CONTROL BOX (Fig 2)

27. The two-way control box, Patt. 0558/198386, supersedes control box, Patt. 0512/12650, and is a complete box that fulfils all the functions that can be performed by the Patt. 0512/12650. In construction, both patterns of box are similar to box, Patt. 0558/198385, but they are smaller and weigh about 35 lbs each.
28. The top plate carries:
 - (a) Microphone.
 - (b) Meter.
 - (c) Call-up lamp and buzzer.
 - (d) Microphone key.
 - (e) Two section selector keys.
 - (f) Two in-use lamps.

Microphone Switching

29. Either the microphone in the control box or an extension microphone can be used, with the microphone key set to PRESS TO SPEAK or REMOTE respectively. The microphone in the control box is still connected to the terminal grid when the key is in the neutral position.

ONE-WAY CONTROL BOX (Fig 3)

30. Like the seven-way and two-way control boxes the one-way box is watertight to 1.5lbs/sq. in. but it has no cover and no microphone.

31. Both parts of the box - case and top plate - are made of cast aluminium alloy. The top plate is hinged to the case at the bottom.

Case

32. The case carries a 12 way terminal grid. All cable entries are made through glands in the bottom of the case and a microphone stowage, cast integral with the case, projects down from the bottom. Lugs for bulkhead mounting are cast on the back of the case. A rubber gasket of circular cross section is fitted into a groove in the flange at the front of the case.

Top Plate

33. Four screws secure the top plate to the case. The top plate is fitted with:-

- (a) Meter.
- (b) Call-up lamp and buzzer.
- (c) Section selector key.

34. The equipment is wired and used in the same way as that on the seven-way control box.

Microphone Switching

35. There is no microphone key. The press to speak switch on the microphone is used when the microphone is in use.

KEY SWITCHES, ROTARY, PATT. 0512/12678 and PATT. 0558/198388

36. Patt. 0512/12678 keys are fitted in the Patt. 0512/12648 and Patt. 0512/12650 series of control boxes. Keys, Patt. 0558/198388, are fitted in the seven-way, two-way and one-way control boxes. The keys are similar to each other in construction but differ in the number of spring sets. Key, Patt. 0512/12678, has been superseded by key, Patt. 0558/198388.

Key, Rotary, Patt. 0558/198388 (Fig 4)

37. The key is watertight and is operated by a rotary movement of the handle in either direction with either locking or non-locking action.
38. The brass body of the key has a threaded section by which it is secured to the top plate of the control box. Fixing is by nut and lock nut and the body is located in the plate by a dowel pin. The joint is made watertight by a rubber gasket and a washer.
39. Passing through the body is a stainless steel spindle of which the outer end carries the key handle and the inner end carries a switch operating device. The spindle

is held in the body by a crimped clip and the key handle is fixed by a screw.

40. The spindle entry is made watertight by silicone grease XG315, Patt. 910-0519, packed in grooves in the spindle. Only grease XG315 should be used in the grooves since other greases may impair the freedom of movement of the spindle at low temperatures and render the spring return movement of the key uncertain.
41. Two banks of contact springs are fitted on each side of the key body. On one side of the body the contact springs are in four sets; each of these spring sets has a make spring a break spring and a lever spring. On the other side of the body there are two complete spring sets and two lever springs. These two lever springs are fitted only to increase the spring return force on the switch operating device. To supplement the return force exerted by the lever springs, each is reinforced by a backing spring in close contact with it. All the springs are 25 SWG nickel silver spring sheet to BSS 790, Hard. The lever springs of each adjacent pair of spring sets are coupled together by a bakelite block.
42. The bakelite blocks are moved by the switch operating device which consists of two rollers. As the handle is turned, the rollers contact the bakelite blocks and the lever springs are forced outwards until they contact the make springs. One roller is shorter than the other. This short roller actuates the lever springs 5 and 25 or 7 and 27 dependent on which way the handle is turned. When the short roller actuates the lever springs 7 and 27, the long roller actuates lever springs 5 and 25. Thus, the lever springs 5 and 25 are actuated no matter which way the handle is turned.
43. Movement through 70° in either direction completes the switching action. For non-locking action, the movement is restricted to 70° by a stop screw in Position A or Position D as shown on Fig 4. For locking action, the stop screw is removed, the movement is restricted by the permanent stop which allows about 110° movement and the rollers are held in position by the lever spring pressure. If a stop screw is inserted in Position B or Position C movement in one direction is prevented and the key is a single throw key. Thus, by changing positions or removal of the stop screws the action can be:-
- (a) Single throw, locking or non-locking.
 - (b) Double throw, locking or non-locking.
 - (c) Double throw, locking is one direction and non-locking in the other.

Key, Rotary, Patt. 0512/12678

44. This key has only four contact units and the rollers are of equal length. By removing one roller of the pair, the key can be changed from a four pole single-throw to a two-pole double-throw switch. For non-locking action, the spring return force will be halved and reinforcement will be required.

KEY, SWITCH PLUNGER, PATT. 0558/198389 (Fig 4)

45. The door switch used in the seven-way control box is the key, Patt. 0558/198389. This key is watertight and has two change-over contacts which are actuated by a

spring-loaded plunger. The gland, through which the spindle passes, is made watertight to 6lb/sq. in. with silicone grease, XG315, Patt. 910-0519.

MAINTENANCE

46. The spring sets of the keys may be adjusted as follows:

- (a) Minimum gap between open contacts = 0.04 inch
- (b) Minimum contact pressure = 150 grammes

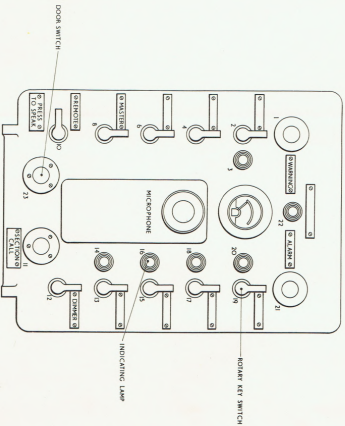
Break before make action must be maintained and no adjustments are to be made unless they have been proven essential.

- 47. Provided that all dust and damp are excluded from the case no routine maintenance is required.
- 48. Ensure that the joint between the top plate and the case is fully watertight by replacement and tightening of all the screws.
- 49. Keep the outer cover tightly closed when the box is not in use.

COMPONENTS LIST

COMPONENTS		CONTROL BOX				
DESCRIPTION	PATTERN	Patt. 0558/198385	Patt. 0558/198386	Patt. 0558/198387	See Note	
					Patt. 0512/12648	Patt. 0512/12650
Buzzer	0512/12518	1	1	1	1	1
Key, Rotary	0512/12678	-	-	-	10	3
Key, Rotary	0558/198388	10	3	1	-	-
Key, Plunger	0558/198389	1	-	-	-	-
Lamp	0584/995-9220	6	3	1	9	3
Meter, Volume	0557/12655	1	1	1	1	1
Microphone	0512/12579	1	1	-	1	1
Push Switch	0512/12675	3	-	-	3	-
Rectifier	0564/204126	2	2	2	-	-
Rectifier	B18-1-1L	-	-	-	2	2
Resistor 10k 10% $\frac{1}{2}$ W	0632/022-2132	2	2	2	-	-
Resistor 3.3k 10% $\frac{1}{2}$ W	0632/022-2069	2	-	-	2	-
Resistor 470 5% $\frac{1}{2}$ W	0632/011-3479	4	-	-	4	-
Resistor 1k 5% 1W	0632/021-5245	1	1	1	1	1
Resistor, variable, 500 ohm 10% $\frac{1}{2}$ W	0632/61373	1	1	1	-	-
Resistors, meter circuit:						
No 1: 4.7k 10% $\frac{3}{4}$ W	0632/022-2090	-	-	-	2	2
No 2: 15k 10% $\frac{3}{4}$ W	0632/022-2153	-	-	-	2	2

Note For the Control Boxes, Patt. 0512/12648 and Patt. 0512/12650 the maximum number of components that may be fitted has been shown.



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
N	N	K	A	W	B										
METER															
	SW	SW	SW												
	11	21	1												

T51

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
MICROPHONES															
MIC															
N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N

TERMINAL STRIPS

T52

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW

SEVEN WAY CONTROL BOX PAT. 0558/190355

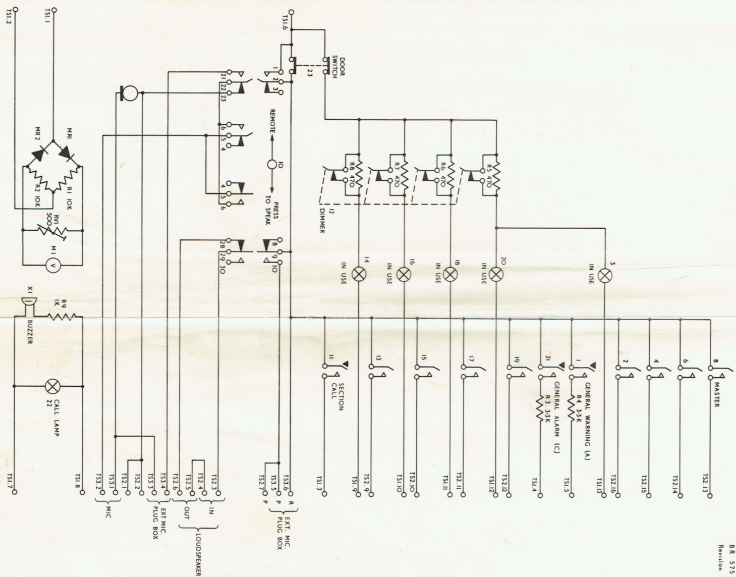


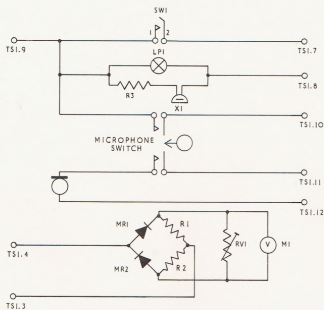
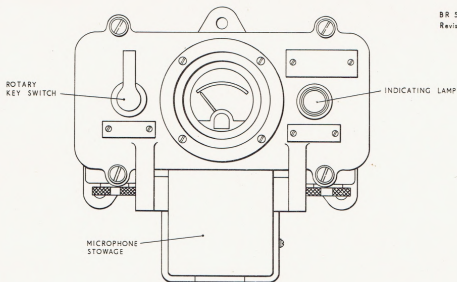
FIG. 1



	1	2	3	4	5	6
MICROPHONE				b	b	b
SW				b	b	b
EXT MIC						
M	M	M	M	P	R	
PLUG BOX						

CIRCUIT DIAGRAM

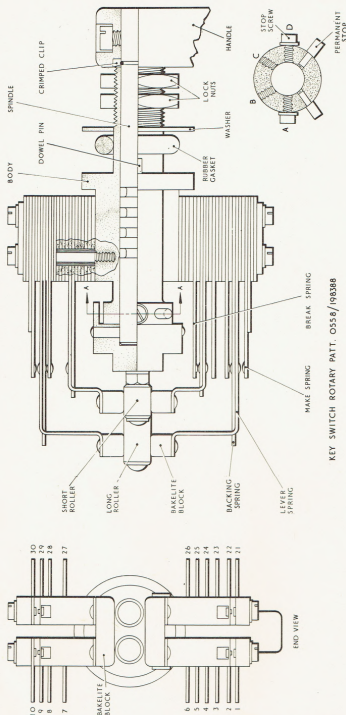




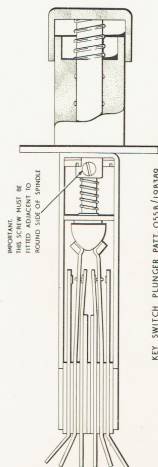
L S	METER	KEY	LAMP	MICROPHONE
BL	WH	BR	GN	
OUTPUT	OUTPUT	KEY	INDICATOR LAMP & MIC.	
SB	SB	N	N	
RELAY PANEL		B	R	P M M
1	2	3	4	5
6	7	8	9	10
11	12			

ONE WAY CONTROL BOX PATT. 0558/198387

FIG.3



KEY SWITCH ROTARY PATT. 0558/198388



IMPORTANT.
THIS SCREW MUST BE
FITTED ADJACENT TO
ROUND SIDE OF SPINDLE

KEY SWITCH PLUNGER PATT. 0558/198389

KEY SWITCHES ROTARY AND PLUNGER

FIG. 4