

AMENDMENTS

When an amendment to this handbook is promulgated the brief details required below are to be filled in.

Amendment No.	Authority (A.F.O. No. etc.)	Date of insertion in this copy.	Initials
1	A.F.O. P. 384/40	24 - 9 - 46	DN
2	" P. 508/48	6 . 5 . 49	<u>ADB</u>

ADMIRALTY, S.W.1.

FEBRUARY, 1946

R. E. 02214/45.

B.R. 1447 (Restricted) "Provisional Handbook for Types 79B/279B" 1946, having been approved by My Lords Commissioners of the Admiralty, is promulgated for information and guidance.

The previous edition, A.S.E. Publication H. 341C, is hereby superseded and is to be destroyed. Certificate of destruction should be rendered to Admiralty Signal Establishment.

By Command of Their Lordships,

H. V. Markham

To Flag Officers and
Commanding Officers
of H.M. Ships and
Vessels concerned.

NOTES ON TYPES 79B/279B.

CONTENTS

	<u>Pages.</u>
<u>CHAPTER 1. INTRODUCTION.</u>	1
<u>CHAPTER 2. OPERATING INSTRUCTIONS.</u>	2 - 6
1 Switching On and Off Procedure.	
2 Instructions for Setting-up and Tuning.	
<u>CHAPTER 3. AMPLIFIER M101, PATT: 59934 (PRE-AMPLIFIER).</u>	7 - 8
1 Purpose and General Description.	
2 - 6 Detailed Description.	
7 Tuning the Pre-Amplifier.	
8 Replacement of 6X53 Valve.	
9 Performance Checks on Pre-Amplifier.	
<u>CHAPTER 4. VIDEO FILTER UNIT.</u>	9 - 11
1 - 3 Purpose.	
4 Connections.	
5 - 6 Controls.	
7 - 10 Operating Instructions.	
11 - 19 Technical Description.	
20 - 21 Valves and Voltages.	
<u>CHAPTER 5. THE SINGLE AERIAL SYSTEM AND DIODE SWITCH.</u>	12 - 19
1 - 4 Brief General Description of the Modifications in Single Aerial Working.	
5 - 6 The Theory of Quarter-Wavelength Transformers.	
7 - 12 Aerial Matching Transformer.	
13 - 24 The Diode Switch and the Feeder Unit.	
25 - 27 The Transformer and Rectifier Unit.	
28 - 30 The Receiver Feeders.	
31 - 32 The Receivers and Transmitter.	
33 Power Supply and Modifications in Wiring.	
34 - 35 Faults and Maintenance.	
<u>CHAPTER 6. PERFORMANCE METER DESIGN 3, PATT: 53914.</u>	20 - 32
1 - 5 Purpose and Scope of the Equipment.	
6 Equipment Required.	
7 Cables and Junction Boxes.	
8 Description	
9 - 12 Test Aerials.	
13 - 19 Test Receiver.	
20 - 25 Test Oscillator.	
26 - 31 Internal Attenuator.	
32 - 34 General Layout.	
35 - 36 Power Supply.	
37 - 41 Fitting of Spares.	
42 - 44 Meter Unit Design 5, Patt: 58520.	
45 - 47 Calculator, Design 1, Patt: 54978.	
48 Use of Calculator with Vertical Coverage Diagram.	
49 - 62 Setting-Up Performance Meter, Design 3.	
 63 - 69 The Attenuator Unit, Design 13, Patt: 57279.	
 70 Example.	
71 - 74 Measurement of Receiver Bandwidth.	
75 Note on Vacuo-Junction.	
76 - 78 Note on Fault-Finding Chart.	
79 - 81 Test Drills.	

CHAPTER 7 TYPES 79B/279B WITH OUTFIT JJ1.

- 1 - 3 Introduction.
 4 - 6 Transmitter "M" Type Attachment, Design 5.
 7 - 9 Maintenance.
 10 - 12 Receiver P114 Output Stage for use with
 Outfit JJ1.
 13 Synchronising Pulse for Outfit JJ1.

I "Chapter 8. Routine Maintenance Directions. 35-36"

- Fig.1 ~~Amplifier M101 - Front and Top Views.~~
 2 ~~Circuit Diagram.~~
 3 Video Filter Unit Design 15 - Block Diagram.
 4 Video Filter Unit Design 15 - Circuit Diagram.
 4A Video Filter Unit Design 15 - Parts List.
 5 Aerial Outfit ATD - Arrangement of Feeders.
 6 - Double Quarter-Wavelength Transformer.
 7 Aerial Matching Transformer.
 8 Aerial Matching Transformer - Schematic.
 9 Transformer and Rectifier Unit.
 10 Diode Switch - Circuit Diagram.
 11 Diode Switch.
 12 Diode Switch and Feeder Unit.
 13 Diode Switch and Feeder Unit - Schematic Diagram.
 14 Automatic Voltage Control Wiring.
 15 Performance Meter Design 3 - Views.
 16 Outline of Test Aerial System.
 17 Performance Meter Design 3 - Circuit.
 18 Meter Unit Design 5 - Circuit.
 19 Fault Finding Chart.
 20 Receiver P114 - Circuit Diagram.
 20A Receiver P114 - Parts List.
 21 Modulator Circuit.
 21A Modulator Circuit - Parts List.
 22 C.R.T. Unit Design B - Modified.
 22A C.R.T. Unit Design B - Parts List.
 23 Control Unit 20AX - Wiring Diagram.
 24 Aerial Array ATD.
 24A Aerial Array ATD - Parts List.
 25 Transmitter "M" Type Attachment Des.5 for Control
 Unit 20AX - I.
 26 Transmitter "M" Type Attachment Des.5 for Control
 Unit 20AX - II.
 26A Transmitter "M" Type Attachment Des.5 for Control
 Unit 20AX - Parts List.

CHAPTER 1

INTRODUCTION

1. Types 79B/279B are Types 79/279 modified in a number of ways to suit present requirements. The modifications include the fitting of certain additional gear, certain minor changes in the circuits of the set itself resulting from them and conversion from double to single aerial working.
2. This handbook describes the modified parts of the sets only and is intended to be read in conjunction with the Handbook for Type 279. It supersedes H.3410.
3. The following is a summary of the changes :-
 - (a) ~~Fitting of pre amplifier (Amplifier M101, Patt: 59934) to the receiver.~~
 - (b) Fitting of Anti-jamming Unit (Filter Unit, Video, Design 15, Patt: 56952). *
 - (c) Fitting of a B.T.U. to the Aerial Control Unit for transmitting bearings to a remote indicator.
 - (d) Fitting of a sync. point to the modulator to synchronise a remote indicator (JJ1) for height finding.
 - (e) In certain ships (where the power supply has to be synchronous with that of a Type 281BQ fitted in the same ship) a modification of the power supply and of the drill for controlling it.
 - (f) Conversion to single aerial working (79B/279B sets) and fitting of a diode switch.
 - (g) Fitting of a Performance Meter (Performance Meter Design 3, Patt: 53914).
 - (h) Modification to the receiver as a result of ~~(a)~~, (b) and (g) and in order to fit the remote indicator (JJ1) and to the indicator (C.R.T. Unit Design 6) as a result of (b). The completely modified receiver is now Receiver P114 (formerly Receiver P11). Diagrams of the new circuit are included in this Handbook.

CHAPTER 2.

OPERATING INSTRUCTIONS.

1. SWITCHING ON AND OFF PROCEDURE.

(a) Switching on (power supply not synchronous).

- (1) See that all switches in both offices are off.
- (2) Make the D.C. Ring Main switch in the transmitting office.
- (3) Make the D.C. switch controlling lights, etc., in both offices.
- (4) See that all the motor field regulators are turned to "reduce speed" position.
- (5) Make the machine changeover switch for the machine which it is desired to run.
- (6) See that the carbon pile voltage control board is switched to "Auto" for this machine.
- (7) Observe the reading of the voltmeter fitted to the D.C. supply.
- (8) Press the "Start" button for the 14 kVA machine which is to be run and wait 30 seconds.
- (9) Adjust the frequency of this machine to 50 cycles with the motor field regulator.
- (10) Adjust the voltage to 230 volts with the control on the carbon pile voltage control board.
- (11) Switch on the aerial control unit and repeat (9) and (10).
- (12) Switch on the transmitter filaments and repeat (9) and (10).
- (13) Check that filament voltage of the oscillator valves (NT75T) is 9 volts and adjust, if necessary, by means of filament control resistance.
- (14) Check Diode filament voltage and bias (see para.2(a)). If Diode is not working properly, ~~Doc Amplifier~~ RECEIVER will be damaged when transmitter is switched on.
- (15) Switch on receiver, modulation generator and cathode ray unit in receiving office, put A.J. switch to "Normal" and repeat (9) and (10).

WAIT THREE MINUTES.

- (16) Switch on transmitter H.T., wait 15 seconds for the relay to operate, increase slowly to required value. Repeat (9) and (10).
- (17) To use warning unit, plug the jack from P11 into the aerial junction box.

NOTE. If "Hand" and not "Auto" regulation is being used, the switch in (6) must be put to "Hand" and the adjustment in (10) made by the regulating resistance on board 2AA regulating.

(b) Switching Off.

- (1) Turn down H.T. slowly and switch off.
- (2) Switch off receiver, modulation generator and cathode-ray unit in receiving office.
- (3) Switch off transmitter filaments and aerial control unit.
- (4) Press the "Stop" button for the machine and turn back the motor field regulator and alternator regulator on the carbon pile voltage control board.
- (5) Switch off light switches, etc., and D.C. Ring Main switch.

(c) Switching ON (synchronous power supply).

NOTE:- Although, when 79B/279B only is fitted, power for the aerial training gear is supplied from the 14 kVA machines, when 79B and 281BQ are fitted supply comes from one 5 kVA machine. This machine is quite independent of the synchronised system and may be started and stopped at any convenient stage.

- (1) When synchronous working is ordered, the 79B transmitting operator must tell the 281BQ transmitting operator which of the two machines he intends to use for 79B.
- (2) Stop the 79B 14 kVA machines and switch off all loads.
- (3) See that the LOCAL/SYNC control switch is at "SYNC".
- (4) Make the circuit breaker for the 14 kVA machine.
- (5) Put the 14 kVA output switch over to this machine.
- (6) When the 281BQ transmitting operator says that the 79B machine may be started, start the machine by pressing the "START" button. Adjustments of frequency and voltage will be made from the 281 office - the 79B operator has no control over them.
- (7) Wait for word from the 281BQ transmitting office, then switch on 79B transmitter filaments.
- (8) Switch on apparatus in receiving office.
- (9) Check that the filament voltage of the oscillator valves (NT57T) is 9 volts and adjust by means of filament control resistance if required.
- (10) Check diode filament voltage and bias. If diode is not working properly the receiver will be damaged when the transmitter is switched on.
- (11) Three minutes after switching on transmitting filaments, switch on transmitter H.T., wait 15 seconds for relay to close and increase H.T. slowly to required value.

N.B. (a) Machine must not be stopped unless 281BQ transmitting operator gives the word.

(b) LOCAL/SYNC control switch must never be moved unless both 79B 14 kVA machines have stopped.

(d) Switching Off (synchronous power supplies).

- (1) Turn down H.T. slowly and switch off transmitter filaments.
- (2) Switch off apparatus in receiving office.
- (3) Tell 281B transmitting operator that 79B is closing down. When he gives the word, stop the 79B 14 kVA machine.

(e) Reverting to Local control of 79B.

When machines have stopped running, put LOCAL/SYNC switch to LOCAL and carry on from (a).

2. INSTRUCTIONS FOR SETTING UP AND TUNING.

(a) The Diode.

It is very important that the voltage across the diode filament when alight should be not less than 6 volts and the transmitter must never be used if the voltage is lower than this, as this would cause damage to the Pre-Amplifier due to lack of protection from the Diode Switch.

To test the voltage, remove the lid of the diode box and connect an avometer across the filament leads at the top of the chokes J (Fig. 11). This voltage should be checked when the set is fitted or whenever the diode is suspected of working badly, and in any case regularly once a week. When the set is first fitted, check that the 7.25 volt tapping on the appropriate winding of the filament transformer is used. It is important that the correct chokes are fitted in the diode switch. The chokes which were previously used have become obsolete because the CV8 diode valve now used passes a larger current, causing too high a voltage drop and excessive heat in these chokes. The new chokes are wound with 32 turns of 22 S.W.G. enamelled copper wire on a former having a length (excluding the socket pins) of 1-19/32 ins. The new chokes are thus 7/32 in. longer than the obsolete ones and are also wound with enamelled wire instead of the silk covered wire previously used.

The diode switch box when modified has a $\frac{3}{4}$ in. hole and the lid has a larger hole where the Silica Gel drier was previously fitted. Both these holes are for ventilation and are covered with copper gauze.

If the supply voltage falls below 230 volts, the filament voltage will also fall. The instruments on the power board may not be correct and they should be checked and adjusted with an avometer.

The bias of the diode should be adjusted (after reference to Chapter 5, para. 3 (c)) as follows :-

- (1) Unplug the transformer and rectifier unit jack from the back of the modulator panel (see Fig. 9) and connect an avometer with positive lead to the tip of the jack. With the filaments on, but the transmitter H.T. switch off, increase the bias by means of the preset resistance (4 in Fig. 9) until the current shown is zero on the lowest scale.

- (2) Disconnect the avometer and put back the plug in the jack in the modulator panel, making sure that the jack plug at the other end is inserted in the jack in the rectifier unit. Remove the lid of the diode box (Fig. 11) and measure the bias voltage across the valve by connecting the avometer between the black heater lead (+) and the case (-). Adjust the preset resistance (4 in Fig. 11) to increase this by one volt.

NOTE:- In some bias units the resistance 7 (Fig. 11) may be only 20 ohms instead of 1,000 ohms and sufficient bias cannot be obtained. A 1,000 ohm resistance should be inserted in such cases.

(b) The Diode Circuit.

This is tuned by the condenser L shown in Figures 10 and 11. Tune for maximum of a fixed echo. The tuning is very flat, but the approximate positions are with the moveable condenser plate $\frac{1}{4}$ in. at 41 Mc/s., $\frac{1}{2}$ in. at 40 Mc/s. and $\frac{2}{3}$ in. at 39 Mc/s.

(c) The Transmitter.

The monitor pictures give some indication of the efficiency of the transmitter, but far better indications are provided by the diode current milliammeter and by the Performance Meter when used to measure radiated power. The diode current milliammeter is mounted in the lower modulator panel and connected to the transformer and rectifier unit by a plug at the back of this panel (Fig. 9). For a given pulse length, the readings of both these meters increase with the transmitter power output (the readings are both proportional to the square root of the power).

To obtain the correct loading of the transmitter the following routine should be followed:-

- (1) With the aerial connections tapped well down the anode lines (loose coupling) adjust the shorting bar until the transmitter is operating at the correct frequency. Until the frequency is within 0.5 Mc/s. of the correct value, the H.T. voltage should not be raised above 12 kV.

NOTE:- To increase the frequency the shorting bar should be raised.

- (2) Adjust the pulse length to 10 microseconds, raise the H.T. to 20 kV. and check that the mains voltage is 230 volts.

- (3) Read the diode current and radiated power from the Performance Meter.

- (4) Move the position of the aerial taps up the anode lines towards the valves. Measure the frequency again and if it has changed readjust the shorting bar to bring it back to the correct value.

- (5) Read the diode current and Performance Meter again.

- (6) Continue this process until the diode current and Performance Meter pass through a maximum.

NOTE. It may be necessary to increase the length of the flexible stranded copper wire connected to the aerial taps to tap near enough to the valve anodes to obtain

maximum power. The correct tapping position is nearer the valve anodes than was normal with Type 79/279).

- (7) Clamp the aerial connections at the point which gives this maximum current and check that the frequency is correct.

Some typical values for the diode current for 20 kV. H.T. are given below :-

Pulse length in microseconds	30	20	15	10	8	Squeg
Diode current in milliamps.	14.0	9.8	7.0	5.0	3.8	1.0

(d) Receiver.

If a fixed echo appears on the screen, tune max. echo in the normal way. If no echoes are available, use the following routine :-

- (1) Unplug the ^{RECEIVER} ~~Pre-Amplifier~~ jack and fix it near the aerial junction box, so that the ground wave does not saturate.
- (2) Tune the oscillator and I/F stages of the receiver for maximum ground wave.
- (3) Plug in the aerial and tune the Pre-Amplifier and the first stage of the receiver for maximum noise.