IN THIS FILE

of a Series of Transmitters named 7C, 7D and 7E [where the C and the E used battery supply] we see an application of an RAF transmitter {the 7D} modified and re-assigned as a Naval Transmitter 7AS [Admiralty Specification]. In the immediate post WW2 years, this was known as the Transmitter 7AS, Pattern No W9188A, but later became known as the

Type 681.

The set was deployed for Fleet Air Arm use and thus available for fitting ashore in RNAS' or in Aircraft Carriers.

The associated receiver was the P42 Pattern No W9184 {also an RAF set} but to date, we have no information on this set. As a matter of interest only, the associated receiver for the Type 75C which became the Type 87 [a VHF transmitter] was the CDU, formerly an RAF receiver called a P104 which post-dates the P42 by many series numbers.

HANDBOOK

FOR

7 WATT V.H.F. TRANSMITTERS

TYPES 7C, 7D AND 7E

EXPLANATORY NOTE.

Transmitter Type 7C is a mobile 7 watt V.H.F. transmitter suitable for 12 volt D.C. operation.

Transmitter Type 7D is a 7 watt V.H.F. transmitter complete with A.C. operated power supply unit.

Transmitter Type 7E is a mobile 7 watt V.H.F. transmitter identical with the Type 7C except for the addition of Public Address facilities.

SECTION A. THE 7D TRANSMITTER.

CHAPTER 1.

GENERAL DESCRIPTION.

(1) PURPOSE AND FACILITIES

The Transmitter Type 7D is a general purpose V.H.F. Transmitter giving an output of about 7 watts on Telephony on any frequency between 30 and 131 Mc/s. It is designed for intermittent operation, and will tolerate large variations of temperature and humidity.

It may be modulated directly from a carbon microphone, and no external microphone battery is required. Anode modulation of the output valve is employed, giving a modulation capability of 100% with quite low overall distortion.

Provision is made for local control of the transmitter, or for an extended local control, e.g., from another room in the transmitter building, where it may be more convenient to have a microphone point.

When a V.H.F. Station Receiver is used in conjunction with the transmitter, local or extended local control of the two is most conveniently obtained by the use of an aerial change-over relay (low power), which is energised from the transmitter H.T. supply. This device ensures that the transmitter and receiver aerial and H.T. switching is done automatically in the proper sequence when the transmitter H.T. switch is depressed (either the one on the transmitter panel or the one at the "extended" point).

The transmitter output is delivered to the aerial via a 70/100 ohm concentric transmission line.

(2) FREQUENCY BAND

The frequency band of 30 to 131 Mc/s is covered by plug-in coils, the correct coils for any given operating frequency being indicated on the chart below. All coils except L1 and L2 are normally soldered in their sockets. (See Chapter 2, Section 4).

Crystal control is used on all frequencies. For output frequencies between 30 and 64 Mc/s the crystal frequency is one-eighth of the output frequency. For output frequencies between 64 and 131 Mc/s the crystal frequency is one-sixteenth of the output frequency.

The entire frequency range is covered in eight groups, the group limits and appropriate coil reference numbers being:—

Band Limits Mc/s	Group	L1	L2	L3	L4	L5	L6	L7	L8
110.5 – 131	1	101	102	103	104	105	106	107	108
92.5 – 110.5	2	111	112	113	114	115	116	117	118
77.5 – 92.5	3	121	122	123	124	125	126	116	128
64.0 – 77.5	4	131	132	133	134	135	136	137	138
53.4 – 64.0	5	141	142	143	113	145	114	147	148
44.4 – 53.4	6	151	152	153	154	155	156	157	158
36.4 – 44.4	7	161	162	163	164	165	166	156	168
30 – 36.4	8	171	172	173	143	175	103	166	178

(3) EXTERNAL POWER SUPPLY

The Transmitter may be energised from any available single-phase A.C. supply of between 200 and 250 volts at 50–60 c/s.

The power taken from the supply is:—

Stand-by (filaments on)	76 Watts
Carrier on	265 Watts

(4) COMPOSITION AND CONSTRUCTION *(See Figures 3 and 4)*

The transmitter unit and its associated power supply unit are mounted on separate decks, which are in turn fixed to the front panel. This complete unit can then be mounted in a standard 19" relay rack, in which case a cover is provided, or it can be mounted in a ventilated steel cabinet for table use.

The transmitter section is a type 7C model (as designed for mobile use) with the cover, sides and baseplate removed, and with the heaters wired for 6.3 volt working.

(5) WEIGHTS AND DIMENSIONS

Weights:—

Cabinet Model	100 lbs.
Rack Model	91 lbs.

Dimensions:—

Cabinet Model	19" wide, 13½" deep, 9" high.
Rack Model	19" wide, 13½" deep, 8¾" high.

(6) CIRCUITS *(See drawing SRLC.239 and Figures 5, 6, 7 and 8)*

(*a*) **TRANSMITTER UNIT.** This unit has four R.F. stages (DET19 twin triodes) and one modulator stage (a KT66 power tetrode).

For output frequencies between 64 and 131 Mc/s, the first triode section of the first valve acts as a combined crystal oscillator and frequency doubler. Winding 1 of L1 is tuned by TC1, and winding 2 of L1 is tuned by TC2 to twice crystal frequency. The harmonic voltage built up across this latter circuit is fed to the grid of the second triode portion of V1 through the 100 pF coupling condenser, C.6.

For output frequencies between 30 and 64 Mc/s, the link shown dotted in the circuit diagram is used, so that the circuit controlled by TC1 feeds R.F. at crystal frequency to the second grid circuit via C6. The condenser TC2 has no effect on these frequency ranges.

In either case, the second triode portion of V1 acts as a frequency doubler, and TC3 and L2 resonate at one-quarter of the output frequency. Energy is taken from this circuit via a coupling link to the circuit L3, TC4 which is tuned to excite the two grids of V2 in push-pull at one-quarter of the output frequency.

This second stage, a push-push doubler, delivers its output to the tuned circuit L4, TC5 at half the aerial frequency. Condensers C8 and C9 are small feedback condensers which increase the efficiency of the stage.

V3 is a further frequency doubler stage and is similar to the previous one except that L5, TC6 is tuned to half the output frequency and L6, TC7 to the output frequency. The output from this stage is link-coupled to a neutralised push-pull amplifier V4. Both the grid circuit L7, TC8 and the anode circuit L8, TC9 are tuned to the aerial frequency. The neutralising condenser NC must be adjusted to balance out the grid-anode capacity of each half of V4, and so prevent self oscillation in the output stage.

All four valves of the R.F. section are adequately protected by cathode resistors in case of excitation failure, and a low-power switch S1 on the front panel reduces the H.T. voltage to the R.F. valves during tuning-up operations. Meter jacks are provided on the front panel for measuring the anode current of all the R.F. valves, and the grid current of the output valve.

The coupling from L8 to the aerial socket is designed so that the valve is correctly matched for working into a load of 70 to 100 ohms. The outer portion of the aerial socket is connected to the transmitter chassis.

The output stage is anode modulated by the KT66 modulator valve, V5, via the modulation transformer T2. The microphone energising current is derived from the cathode circuit of this valve as follows:—R22 is a voltage dropping resistor which is included to enable the KT66 to work from the 300 volt supply without over-dissipation. The voltage drop across this resistance is used as the source of supply, and a suitable value of microphone current is obtained by means of the potentiometer R26, R 27. T1 is the microphone transformer.

(*b*) **THE POWER SUPPLY UNIT** uses two directly heated high-vacuum rectifier valves type U52, each connected as a half-wave rectifier. These are then used in the normal full-wave rectifying circuit.

Choke CH1 provides a choke input from the rectifiers to the filter circuit C30, CH2, C31.

The mains input to the set is taken through a 5 amp. double-pole fuse to the "Filaments" switch S3. This, when closed, energises the filament transformer T3, which provides 6.3 volts for the valve heaters and for the green filament pilot lamp as well as 5 volts for the rectifiers. When S3 has been closed, closure of S4, the "H.T." switch, energises the H.T. Transformer T4. A pilot winding on this transformer lights the red H.T. pilot lamp on the panel.

A multiway plug and socket connector mounted at the rear of the power supply is used as the main input to the complete transmitter. It carries connections for mains input, remote microphone, remote switching and aerial changeover relay. A similar plug and socket connects the transmitter to the power supply.

The microphone may be plugged into the jack on the front panel or connected to terminals 11 and 12 of the multiway connector.

The relay N/2 takes part in the switching as follows:—Assume the station to be in the receive condition with all heaters on. When the H.T. switch S4 is closed, a current passes through R30, through the coil of the aerial change-over relay (connected across terminals 9 and 10) and finds an earth on one of the contacts of the aerial relay. The latter operates, and the earth is transferred to the loudspeaker, so muting the receiver. Current now flows through N/2 in series with the aerial relay, so that N/2 operates and puts H.T. on the transmitter at contact N1 and removes H.T. from the receiver at contact N2. Observe that H.T. cannot be applied to the transmitter unless the aerial relay has operated, thus minimising the risk of running the transmitter without a load. Observe also that S4 is inoperative unless the filament switch S3 has first been operated.

NAVAL ADDENDA.

(Transmitter 7AS, Type No. 681).

1. **Admiralty Pattern Numbers** of equipment referred to in the text of this handbook are listed below:—

Equipment	Pattern No.
Transmitter Type 7D (Transmitter 7AS, Type No. 681)	W.9188A
Carbon Microphone	W.9189
V.H.F. Station Receiver Type 1 (Receiver P42)	W.9184
V.H.F. Station Receiver Type 2 (Receiver P42)	W.9184A
Aerial Changeover Relay, Low Power, Station Type (For use with 7D)...	50035
Aerial Changeover Relay, Low Power, Mobile Type (For use with 7C etc.)	W.9347

2. Valves

Admiralty or Air Ministry Pattern Valves which can be substituted for those supplied with the 7D Transmitter, if necessary, are:—

Valve	Type		Pattern No. of Admiralty or A.M. substitute
V1	DET19		Ad. Patt. CV18
V2	,,		,, ,,
V3	,,		,, ,,
V4	,,		,, ,,
V5	KT66	VT75	Ad. Patt. CV1075 A.M. Patt. 10E/11533
V6	U52	5U4G	Ad. Patt. W.4000
V7	U52	,,	,, ,,

Note: Valve 6L6G, Ad. Patt. No. CV1947 (A.M. Patt. No. 110E/24) can be used as an alternative to valve type KT66 in mains-operated equipments only. It should not be used in mobile (12 volt) equipments, as its heater current is different from that of the KT66 valve.

3. Aerials

The aerials described in Chapters 3 and 7 will not, as a rule, be employed at Naval Stations. The following will be supplied in lieu:—

Aerial Outfit ARS (mobile) and ARY (fixed), comprising dipole with reflector and director.

The aerial units themselves are identical, the method of fixing to masts being the only point of difference. The same pattern numbers should be quoted, therefore, when demanding aerials, whether for aerial outfit ARS or ARY. These are as follows: —

Patt No.	Aerial Freq. Coverage	Colour Scheme	Code Letter
W9365	85 – 86.9 Mc/s	Red	D
W9366	87 – 88.8 ,,	Green	E
W9367	88.9 – 90.8 ,,	Blue	F
W9518	90.9 – 92.8 ,,	White	G
W9519	92.9 – 95 ,,	Yellow	H

Other aerials are also employed, but these shown above are standard and are most commonly used. In this connection, attention is invited to S.S.143.

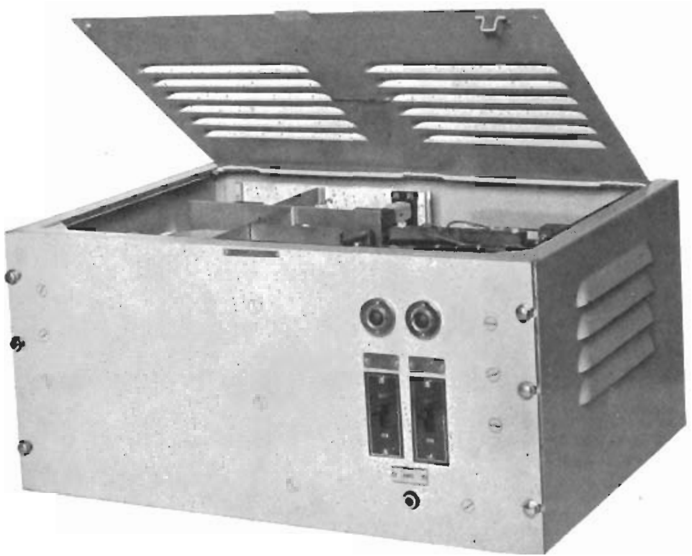


FIG.3 7D TRANSMITTER-CABINET MODEL.

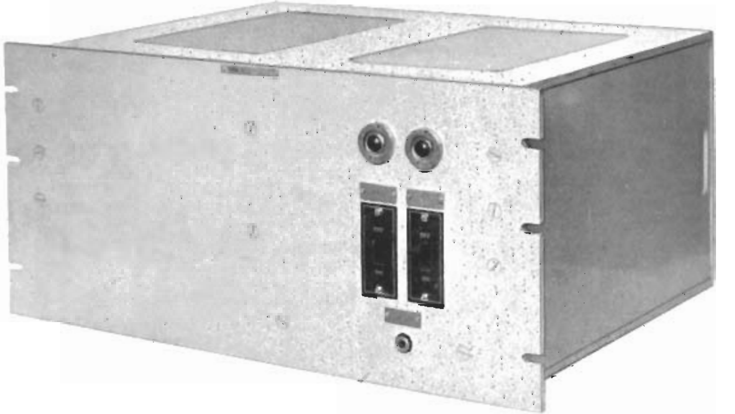


FIG.4 7D TRANSMITTER-RACK MOUNTING MODEL.

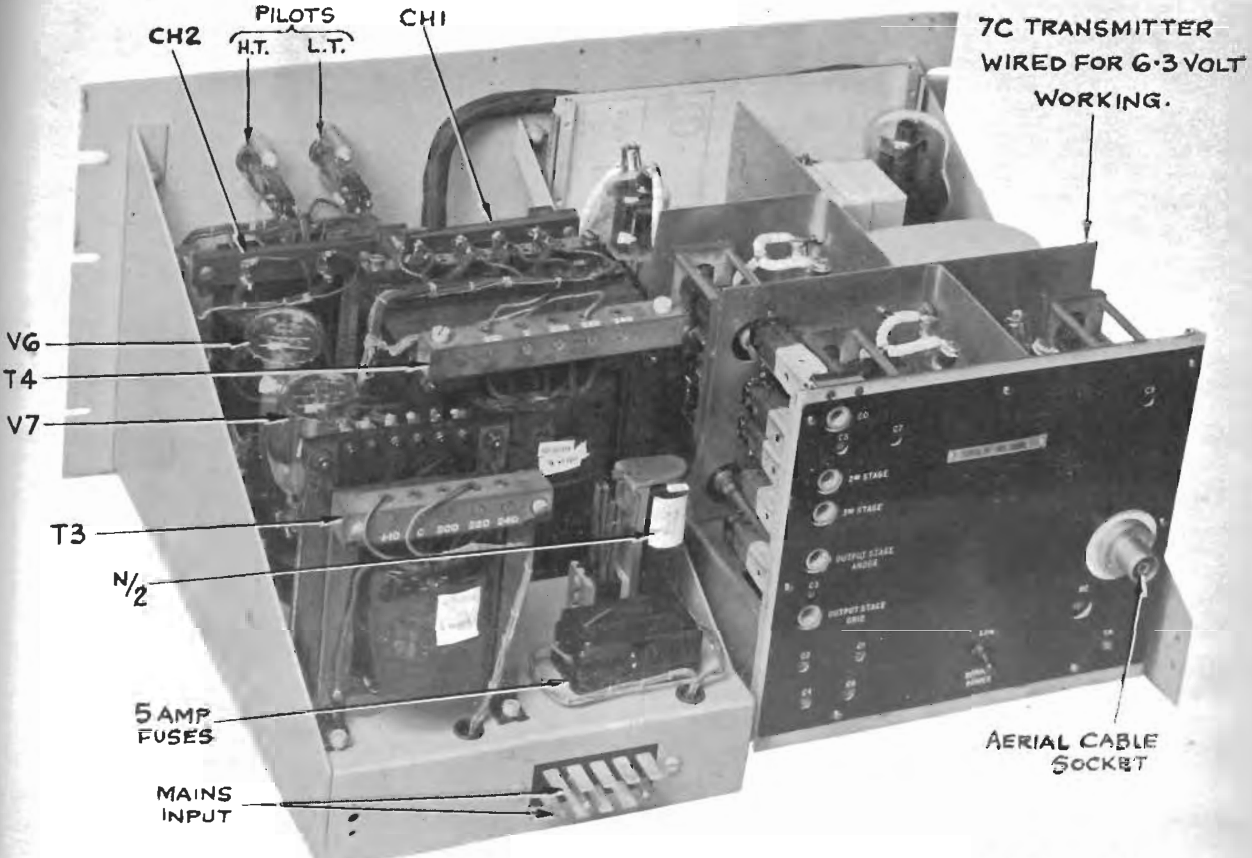


FIG. 7 7D TRANSMITTER (REAR VIEW).

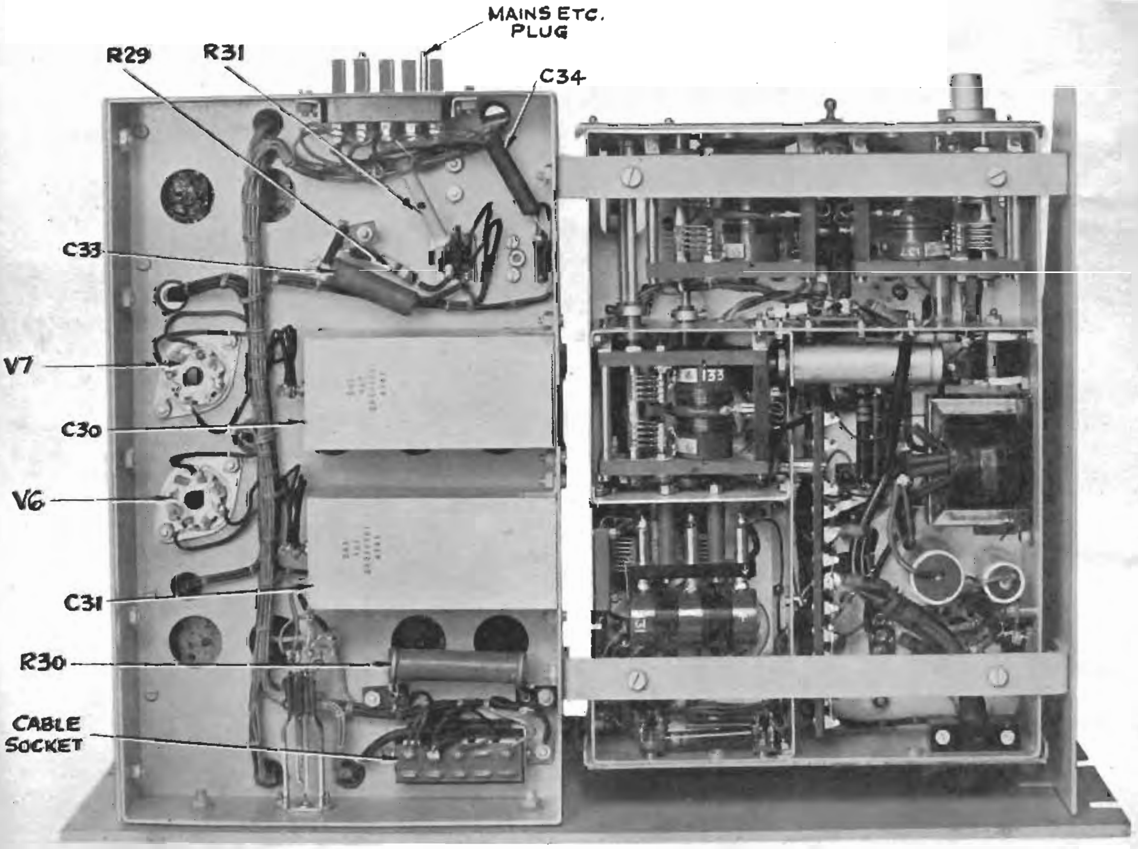
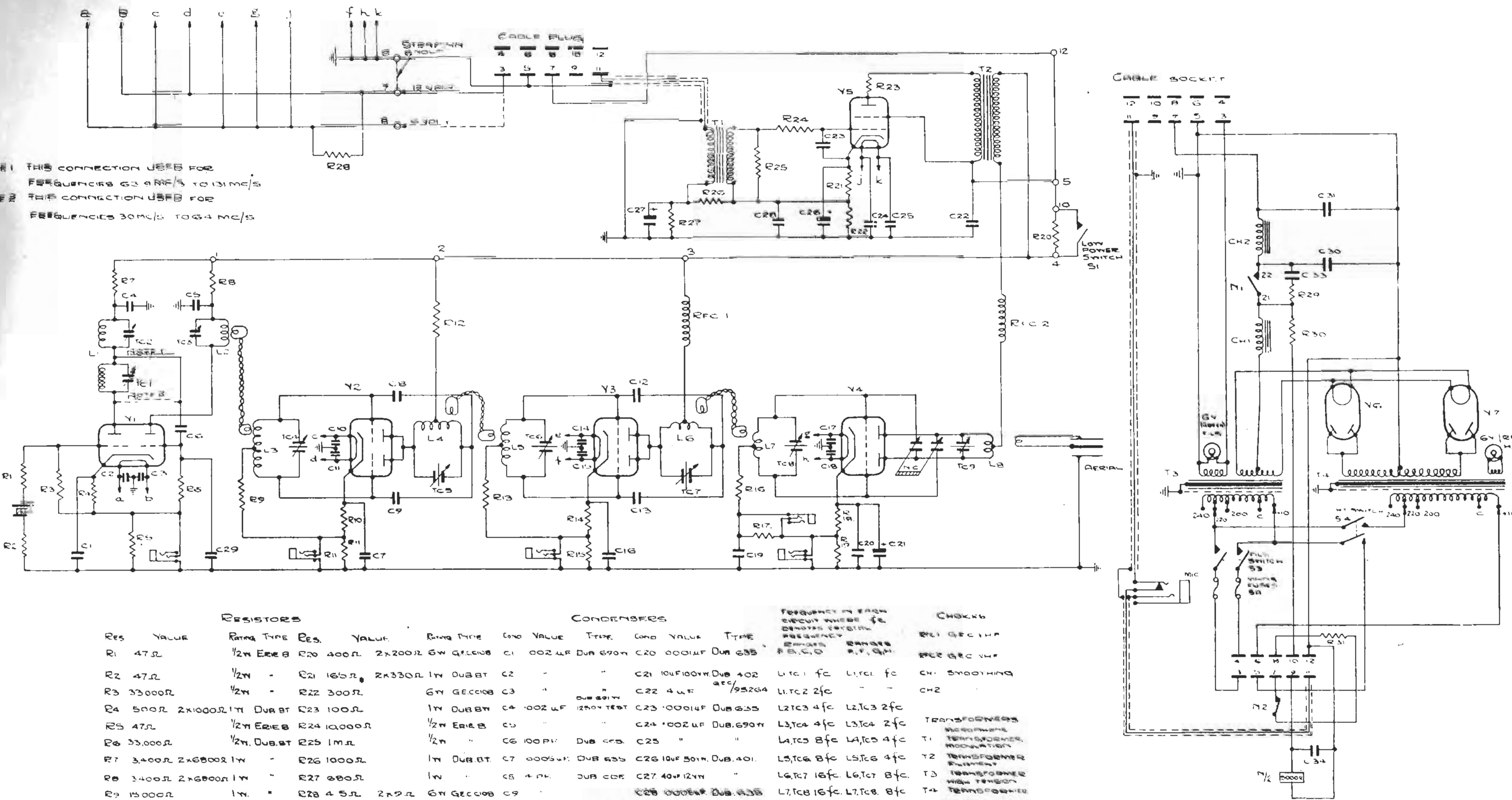


FIG. 8 7D TRANSMITTER (UNDERSIDE).



Note 1 This connection used for frequencies 63.9 Mc/s to 131 Mc/s

Note 2 This connection used for frequencies 30 Mc/s to 64 Mc/s

Resistors

Res	Value		Rating	Type	Res.	Value		Rating	Type
R1	47Ω		½W	Erie 8	R20	400Ω	2×200Ω	6W	G.E.C.C108
R2	47Ω		½W	"	R21	165Ω	2×330Ω	1W	Dub BT
R3	33000Ω		½W	"	R22	300Ω		6W	G.E.C.C108
R4	500Ω	2×1000Ω	1W	Dub BT	R23	100Ω		1W	Dub BW
R5	47Ω		½W	Erie 8	R24	10,000Ω		½W	Erie 8
R6	33,000Ω		½W.	Dub.BT	R25	1MΩ		½W	"
R7	3,400Ω	2×6800Ω	1W	"	R26	1000Ω		1W	Dub.BT.
R8	3,400Ω	2×6800Ω	1W	"	R27	680Ω		1W	"
R9	15000Ω		1W.	"	R28	4.5Ω	2×9Ω	6W	G.E.C.C108
R10	500Ω	2×1000Ω	1W	"	R29	47Ω		½W	Erie 8
R11	47Ω		½W.	Erie 8	R30	33,000Ω		3W	Dub B.W
R12	235Ω	2×470Ω	1W.	Dub BT	R31.	47Ω		1W	Erie 2
R13	19,500Ω	2×39,000Ω	1W.						
R14	500Ω		6W.	G.E.C.C108					
R15	47Ω		½W	Erie 8					
R16	2,200Ω		1W	Dub.BT					
R17	47Ω		½W	Erie 8					
R18	500Ω		6W	G.E.C.C108					
R19	47Ω		½W	Erie 8					

Condensers

Cond	Value	Type	Cond	Value	Type
C1	·002 µF	Dub 690W	C20	·0001µF	Dub 635
C2	"	"	C21	10µF 100VW.	Dub 402
C3	"	"	C22	4µF	G.E.C./95264
C4	·002 µF	Dub 691W 1250V Test	C23	·0001µF	Dub.635
C5	"	"	C24	·002 µF	Dub.690W
C6	100 PF	Dub CCS.	C25	"	"
C7	·0005µF	Dub 635	C26	10µF 50VW.	Dub.401.
C8	4 PF.	Dub CDE	C27.	40µF 12VW	"
C9	"		C28	·0005µF.	Dub.635
C10	·0005µF	Dub 635	C29.	25 PF	Dub. CCS.
C11		"	C30	4µF.	G.E.C./86361.
C12	2 PF.	Dub.CDE	C31	-	"
C13		"			
C14	·0001µF	Dub 635	C33	·01µF	G.E.C./86102
C15	"	"	C34	·01µF.	G.E.C./85676
C16.	"	"	N.C.	Neut cond 6.6 PF ganged	G.E.C.
C17	"	"			
C18	"	"			
C19	·0005µF	"			

Relay

M/2 H10R/A020B

Frequency in each circuit where fc denotes crystal frequency

Ranges A, B, C, D		Ranges E, F, G, H	
L1 TC1	fc	L1,TC1	fc
L1.TC2	2fc	-	-
L2 TC3	4fc	L2,TC3	2fc
L3,TC4	4fc	L3,TC4	2fc
L4,TC5	8fc	L4,TC5	4fc
L5,TC6	8fc	L5,TC6	4fc
L6,TC7	16fc.	L6,TC7	8fc.
L7,TC8	16fc.	L7,TC8.	8fc
L8,TC9.	16fc	L8,TC9.	8fc

Valves

Y1.	Det. 19.
Y2.	"
Y3.	"
Y4.	"
Y5.	KT. 66
Y6	U 52
Y 7.	

Chokes

RFC1	G.E.C. VHF
RFC2	G.E.C. VHF
CH1	Smoothing
CH2	

Transformers

T1	Microphone Transformer,
T2	Modulation Transformer
T3	Filament Transformer
T4	High Tension Transformer

Tuning Condensers

TC1	65PF Eddystone Max 1013
TC2	"
TC3	12PF Eddystone Max ·32
TC4	G.E.C.
TC5	"
TC6	"
TC7	"
TC8	"
TC9	"

Note:—In the latest models, R30 is 22,000 ohms, vitreous type.

SRLC 239. Station Transmitter, Type 7D.