WIRELESS SET NO. 46

FIRST ECHELON WORK

Note: This issue, Pages 1 and 2, supersedes Pages 1 and 2 of Issue 1, dated 18 Jan., 1945. Items marked ● in Table 2 have been amended.

ROUTINE TECHNICAL MAINTENANCE

General

1. Ensure that the set is kept clean and that the valves fit tightly in their sockets. Keep the 6-pin plug on the set and the corresponding socket on the lead clean and free from moisture. Check that the snatch plugs are in good condition, that the leads are well soldered to the contacts and that the contacts are satisfactory. The aerial sections should be kept clean and free from corrosion and the parts where they are joined together should be lightly greased with Vaseline.

Waterproofing

2. Good waterproofing is essential in view of the operational requirements of the set. Ensure that the rubber sheath over the 6-pin plug is well seated down. Check that the main case gasket and the gasket on the junction box are in position and that the four screws holding the case to the front panel are evenly tightened so that the panel edge is level.

Voltage and current readings

3. Detailed examination for faulty components is facilitated by comparing voltages and currents with those given in Table 3. Tests Nos. 3 to 15 were measured on an Avometer, universal, 46-range (model 7), on the 400V range, and tests Nos. 16 to 25 on the 10V range of the same instrument. If a voltmeter taking a greater current is used, readings will be rather lower in some cases. The battery voltages were exactly 150V, 3·0V and 12·0V; provided that the H.T. and G.B. are reduced in the same proportion, figures may be reduced proportionately when checking on a slightly lower voltage. Figures were taken with the aerial tuned accurately and the set under normal working conditions; figures for tests Nos. 1 and 4 will vary considerably under the conditions on send. All voltages are measured relative to chassis.

Maintenance tasks

4. It is recommended that the points mentioned in paras. 1 and 2 should be checked fortnightly by a Signals electrician or instrument mechanic. The readings detailed in para. 3 should be taken fortnightly and a log should be kept for each set so that any abnormal changes may be noted and action taken accordingly.

REPAIR INFORMATION

Fault-finding

5. The output of the sender may be checked by connecting the dummy aerial into the aerial socket. The brightness of illumination of the 6V lamp B1A indicates roughly the sender output. The H.T. current when the sender is accurately tuned should not exceed 35mA on R/T or 45mA on M.C.W.; the rise in current on switching to M.C.W. provides a check of the percentage modulation. This rise should be between 8mA and 11mA. If the H.T. current is excessive, check the bias circuit.

6. In the aerial tuning circuit and the coil units the main difficulty likely to be encountered is, apart from wiring faults, a possible failure to tune with crystals at the extreme limits of the band.

7. Some difficulty may occur in tuning with the 16 ft. F aerial, especially at the highest frequencies. To overcome these difficulties, shorten the lead-in as far as possible; if this does not overcome the fault, use the L terminal on the aerial adaptor in place of the F terminal.

8. When setting up new crystals, it might be found that, with a crystal at the high-frequency end of the band, even with the internal trimmer set to zero, the tuning point comes below 2·0 on the AERIAL TRIM adjustment. After checking all other possible causes of the trouble (e.g., trying another crystal and dummy aerial), break the paper seal (over the hole nearer to the control panel of the set) on the coil unit and turn the core slightly anti-clockwise until tuning is obtained.

9. If a reading greater than 2·5 is required to tune to a crystal at the extreme low-frequency end of the band (with internal trimmer at maximum), this can be accepted, provided the other crystals can be trimmed.

10. If it is found that a receiver crystal near the highest frequency in the band will not oscillate, while others of lower frequency do oscillate, it is possible that L2A (or other oscillator coil) is tuning to too low a frequency. After checking all other possible causes of the trouble, such as trying another valve and crystal of the same or adjacent frequency, and trying the crystal in another channel, break the paper seal over the hole farthest from the control and turn the iron-dust core adjustment slightly anti-clockwise until oscillation is obtained.

Changing the frequency channels: fitting crystals and coil units

11. Coil units are available to cover the following frequency bands :—

Mc/s	Mc/s
7·9—9·1 (yellow)	5·0—6·0 (blue)
6·4—7·6 (white)	3·6—4·3 (red)

Any three frequency channels in any one of the above bands may be allocated for a given set. Two crystals are required for each frequency channel: one is for the sender, and is marked on the side with an S followed by the channel frequency in kc/s; the other is for the receiver oscillator and is marked with an R followed by the channel frequency in kc/s. The crystal is also marked with a coloured dot, corresponding with that on the coil units, and with the ZA number. The actual frequency of the crystal itself is also shown in small figures on the top of the crystal.

Frequency range	*Frequency limits*	*Colour marking*
1	7·9—9·1Mc/s	Yellow
2	6·4—7·6Mc/s	White
3	5·0—6·0Mc/s	Blue
4	3·6—4·3Mc/s	Red

Table 1—Frequency range colour coding

Changing frequency channels

12. The procedure for changing frequency channels is as follows :—

(*a*) Remove the chassis from its case after loosening evenly, a few turns at a time, the four slotted screws at the corners of the top panel. This must be done very carefully to avoid damage to the set or the rubber gasket on the case.

(*b*) Remove the crystal retainer and crystals ; also remove the plug-in coil if the new channels are in a different band (different colour spots). Crystals and coil unit should be carefully eased out with the aid of a screwdriver.

(*c*) Plug in the new crystals and coil unit, making sure that the former are all in the correct positions (for sender and receiver, and for channels A, B and C) as marked on the chassis, and that the colour of the spot is the same on all crystals and on the coil unit. The colours are given in Table 1.

(*d*) Plug in the dummy aerial and set the external aerial trimmer knob accurately to 2·5 on the scale, unless the 7·9—9·1Mc/s band is in use, in which case set to 3·0 on the scale. Switch to M.C.W., put on the headphones, switch on the set and keep the send-receive switch depressed.

(*e*) Switch the CHANNELS switch to A, and adjust the pre-set aerial trimmer for channel A (front one) with a screwdriver very slowly and very carefully ; start at maximum (line on rotor pointing down towards coil unit) and turn until the loud tuning note just comes in.

(*f*) Repeat the procedure of (*e*) very carefully on the other two channels in turn.

(*g*) Check that no readjustment of the AERIAL TRIM is required when switching over from one channel to another.

(*h*) Make sure that the receiver oscillator is working on all channels as follows : On touching a screwdriver on and off the aerial socket, loud clicks should be heard, but these should be nearly inaudible when the crystal for the channel in use is removed from its socket.

(*j*) Mark the new frequencies on the frequency record disc attached to the set.

(*k*) Switch off, replace the crystal retainer, and replace the set carefully in the case. Finally, screw up the four case-retaining screws, going round each in turn several times, and making sure that the panel is bedding down evenly all round.

During the above process certain difficulties may occasionally arise. Thus, the correct tuning point in operation (*e*) or (*f*) above may appear to be slightly outside the range of the internal trimmer in question ; this can usually be corrected by a very slight adjustment of the AERIAL TRIM knob.

No. of terminal in junction box	*Marking on top plate*	*6-way cable*	*5-way cable*	*Operator's 3-way cable*	*Extra 3-way cable*
1. L.T. +	+3V	Blue	●Red		
2. Phones		Yellow		White (green end)	White (green end)
3. H.T. + set		Red			
4. H.T. + batt.	+150V		●Green		
5. Mic.		Green		White (red end)	White (red end)
6. G.B.—	—12V	White	Yellow		
7. Case		Black	White		
8. Case			Blue		White (blue end)
9. Case				White (blue end)	

●Table 2—Junction box internal connections

Notes: 1. On preproduction models, serial Nos. 1–32, the yellow wire of the 6-way cable was connected to terminal 5 in the junction, and the green wire to terminal 2. Correspondingly, the connections from phones and microphones to the male snatch plug were interchanged.

2. The socket marked +12V on battery is connected through the case of the set and junction box, and to L.T.—

3. The socket marked H.T.—on battery is used to supply grid bias (—21V) to set.

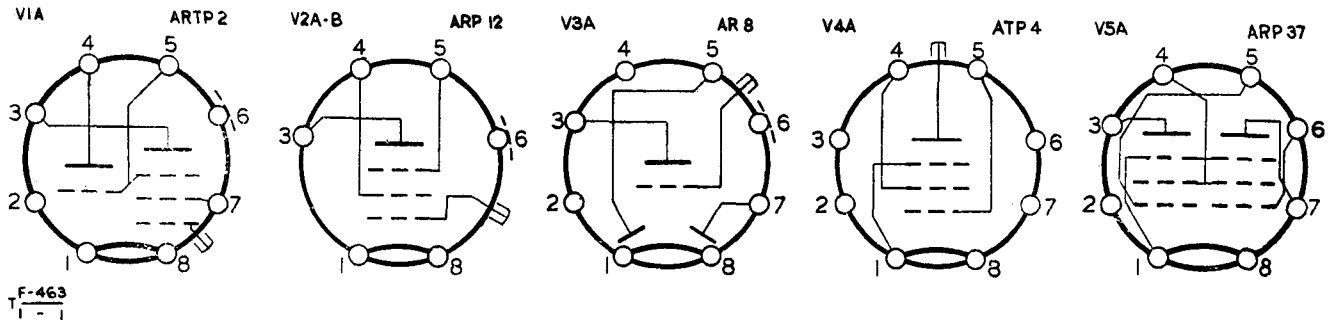

Fig. 1—Valve bases

Test No.		*R/T*		*M.C.W.*	
		Send	*Rec.*	*Send*	*Rec.*
1	Total H.T. current	30mA	11mA	40mA	11mA
2	Total L.T. current	0·62A	0·38A	0·62A	0·93A
3	V4A anode voltage	147V	0	144V	0
4	V4A screen (pin 4)	85V	0	80	0
5	V1A screen (pin 7)	0	60V	0	60V
6	V1A pentode anode (pin 3)	0	145V	0	145V
7	V1A screen (pin 4)	0	60V	0	60V
8	V2A screen (pin 4)	0	70V	0	70V
9	V2A anode (pin 3)	0	145V	0	145V
10	V2B screen (pin 4)	0	50V	0	50V
11	V2B anode (pin 3)	0	145V	0	145V
12	V3A anode (pin 3)	90V	0	75V	0
13	V5A screen (pin 4)	150V	0	150V	0
14	V5A anode (pin 3)	148V	0	145V	0
15	V5A anode (pin 7)	148V	0	145V	0
16	T2A sec. No. 1 (hot)	−10·5V	−10·5V	−10·5V	−10·5V
17	T2A sec. No. 2 (hot)	−10·5V	−10·5V	−10·5V	−10·5V
18	Junction of R15A and R17A	−2·2V	−2·2V	−2·2V	−2·2V
19	T3A sec. (hot)	−1·0V	−1·0V	−1·0V	−1·0V
20	V1A filament (pin 8)	0	2·25V	0	2·20V
21	V2A filament (pin 8)	0	2·25V	0	2·20V
22	V2B filament (pin 8)	0	2·25V	0	2·20V
23	V3A filament (pin 8)	2·22V	2·25V	2·22V	2·20V
24	V5A filament (pin 8)	2·35V	0	2·35V	2·32V
25	V4A filament (pin 8)	2·35V	0	2·35V	2·32V

Table 3—Voltage and current test figures

Valve	*Position of K1A-B*	*Electrode*	*Pin*	*Resistance*	
				to	
V1A	RECEIVE	G2	7	HT +	27kΩ
		A	3	HT +	2·3kΩ
		G0	5	Ch	100kΩ
		A0	4	HT +	27kΩ
V2A	RECEIVE	A	3	HT +	2·2kΩ
		G2	4	HT +	47kΩ
V2B	RECEIVE	A	3	HT +	1·7kΩ
		G2	4	HT +	150kΩ
V3A	SEND	A	3	HT +	47kΩ
		G1	TC	Ch	100kΩ
V4A	SEND	G2	4	HT +	11kΩ
		A	5	HT +	250Ω
		G1	TC	Ch	47kΩ
V5A	SEND	A1	3	HT +	250Ω
		A2	7	HT +	200Ω
		G2	4	HT +	S.C.

Table 4—Valve pin resistance readings

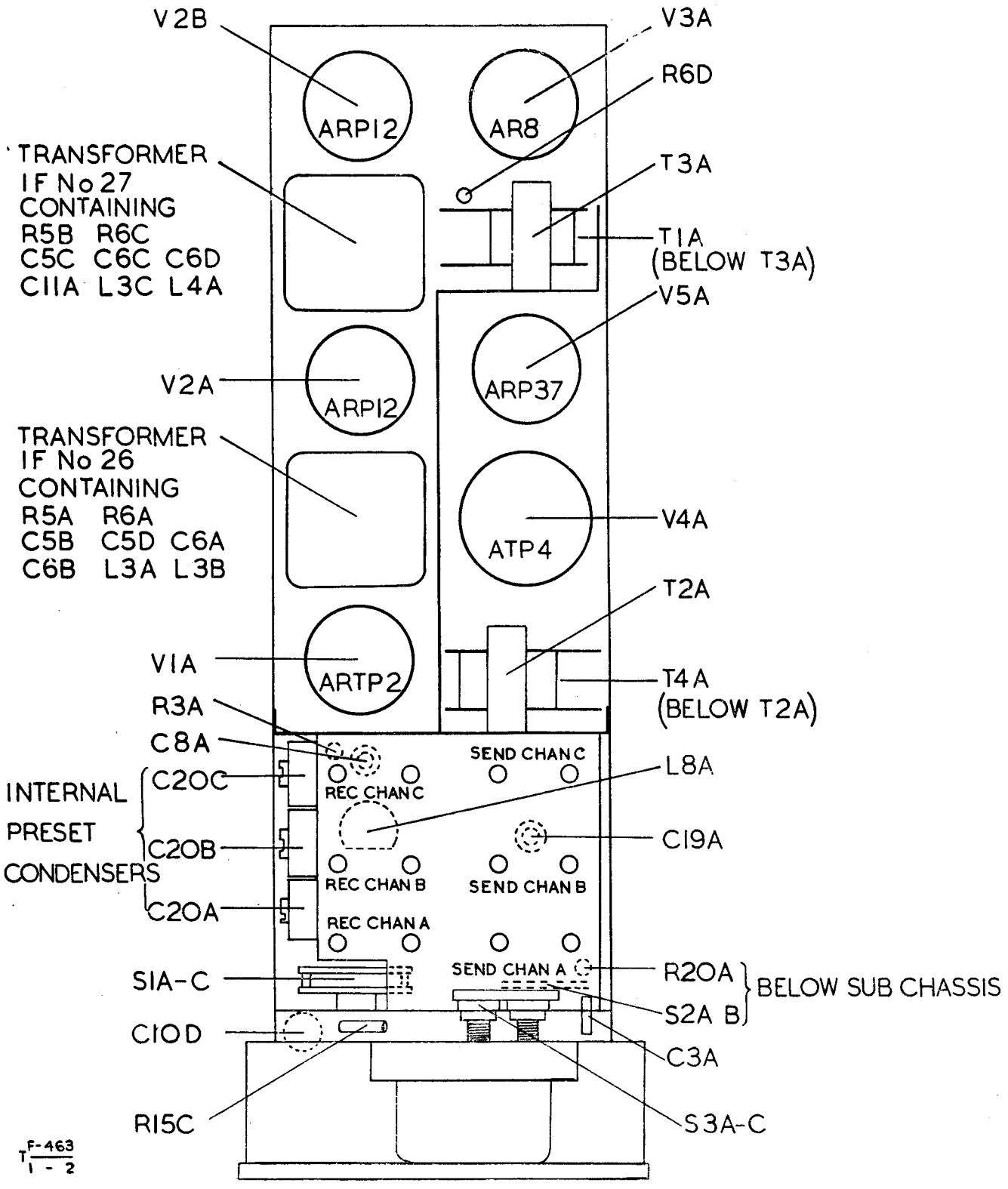

Fig. 2—Top component layout diagram

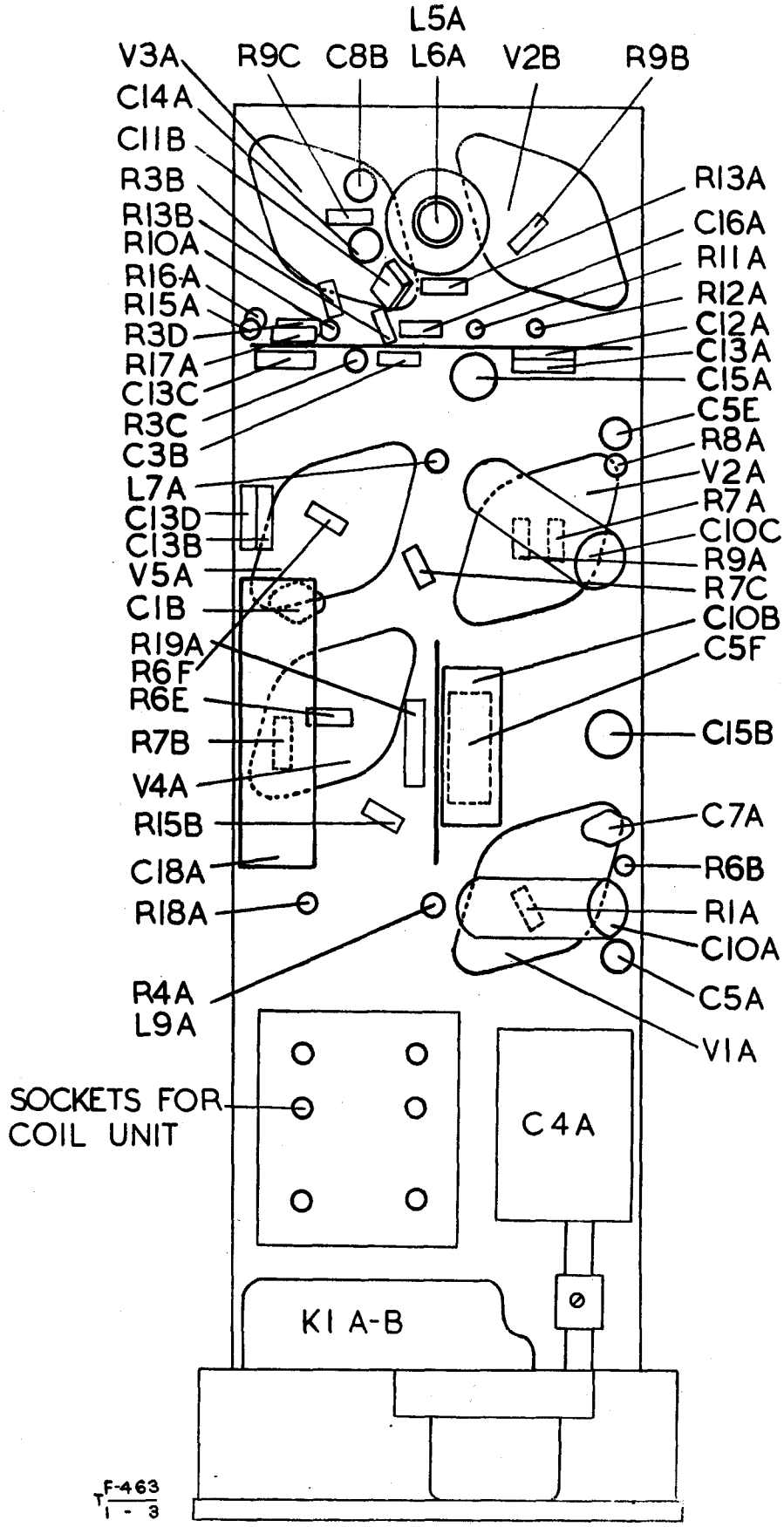

Fig. 3—Bottom component layout diagram

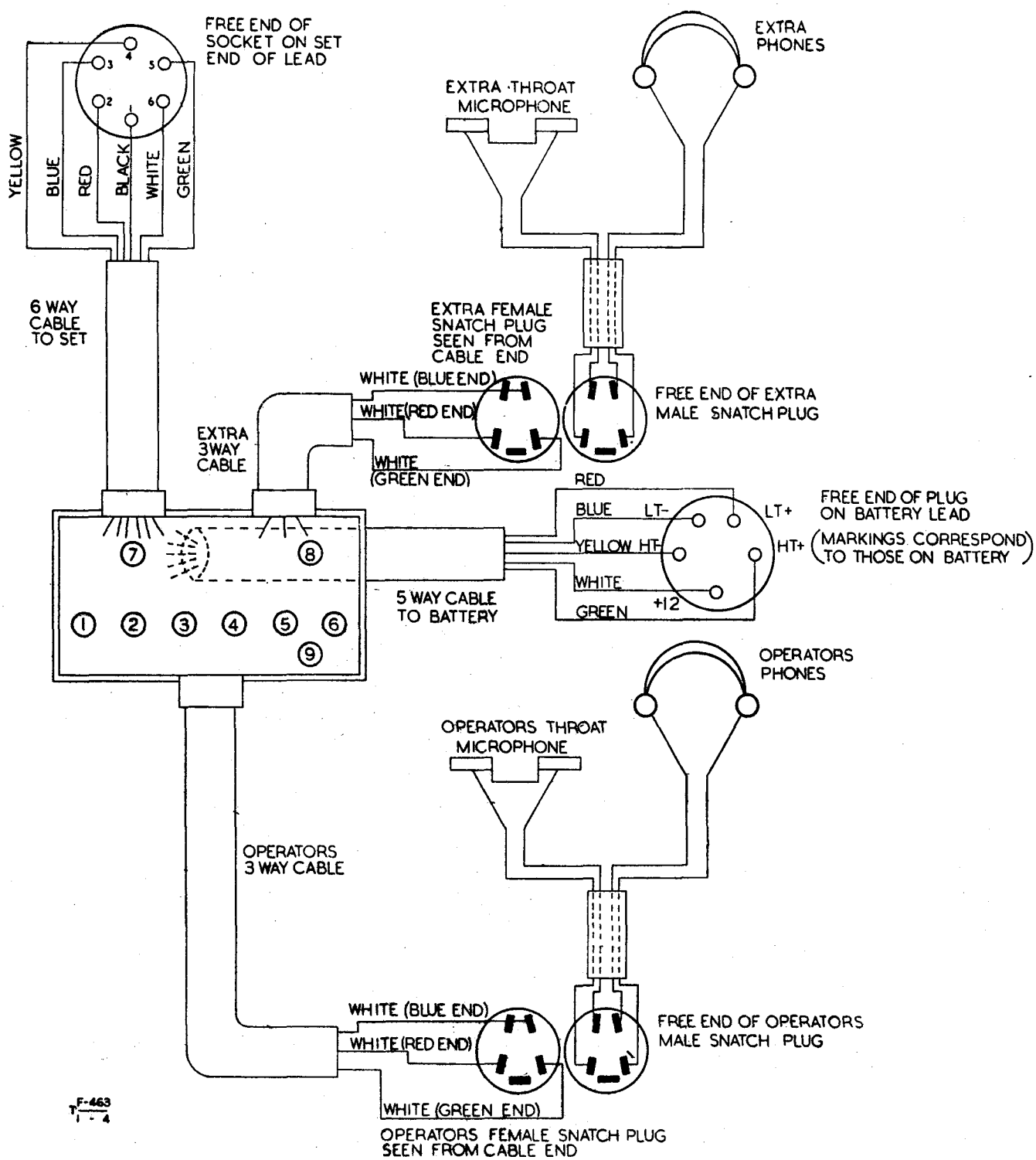

Fig. 4—External connections to set

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