AMPLIFIERS, R.F., No. 2, Mk. I and Mk. II

GENERAL DESCRIPTION

PRELIMINARY DETAILS

Purpose

1. The amplifier is intended for use with the Wireless set No. 19, its purpose being to amplify the modulated output of the set and so increase the range of the station. The equipment consists of the amplifier unit and an aerial tuning inductance, Inductance, aerial tuning, No. 1, which replaces the aerial variometer normally used with Wireless set No. 19. The standard aerial variometer must not be used with the amplifier. The amplifier has been designed for automatic send/receive operation from the normal microphone pressel switch on R/T, and is fitted with a manual send/receive switch for C.W. working. When the amplifier is switched off, the Wireless set No. 19 can be operated alone as a low-power station.

Electrical

2. The circuit arrangement is a straightforward linear amplifier, four ATS25 valves being used in parallel. The input circuit is resonant outside the frequency band covered, and is arranged for control and measurement of drive level. The anode circuit is tuned by a variable condenser and connected by low-impedance line to the aerial tuning inductance. H.T. supply is obtained from a rotary transformer which is started automatically by relays when the pressel switch is operated. Send/receive interlocking on R/T and M.C.W. is obtained by passing the H.T.2 supply current of the Wireless set No. 19 through the coil of a control relay in the amplifier. Two aerial meter transformers are used in conjunction with the Wireless set No. 19 panel meter; one meter indicates the output from the amplifier and the other, connected when the amplifier is switched off, indicates the output of the Wireless set No. 19 only.

Mechanical

3. The amplifier is constructed as a self-contained unit with the rotary transformer mounted at one end of the chassis. The standard Wireless set No. 19 flick mechanism is used on the anode tuning condenser. A modified Wireless set No. 19 case is used; metal fixing plates are welded to the bottom of the case to provide for fixing the amplifier to the top of the Wireless set No. 19, as an alternative to carrier mounting. A protective grille with waterproof cover is fitted.

Differences between Mks. I and II models

4. Amplifier, R.F., No. 2, Mk. II is designed for continuous operation on send and has a cooling fan fixed to the rotary transformer shaft. This fan draws in air for cooling through a dust filter fixed on the back of the case. The dust filter must be inserted in its holder with the folds vertical and the *inlet* face outwards.

5. Amplifier, R.F., No. 2, Mk. I has no cooling system and must not be operated continuously on send for more than 15 min. in each hour or 20 min. on normal operation. This restriction does not apply to any amplifier on which Tels. K 317 Modification Instruction No. 1 has been carried out. Four condensers connected in a series-parallel arrangement were fitted in place of C6A (Tels. K 317 Modification Instruction No. 2 refers).

6. On sets of serial numbers below 1900 (approx.) R13A was omitted.

Controls (Fig. 1)

7. (*a*) ON-OFF switch (S6A) controls 12V supply to valve heater and relays.

(*b*) Frequency RANGE switch (S2A/1-3).

(*c*) C.W. SEND/NORMAL switch (S1B) used on C.W. only, starts rotary transformer and cuts out automatic send/receive control.

(*d*) METER switch (S1A) permits Wireless set No. 19 panel meter (with its meter switch set to AE) to read either aerial current or amplifier drive level.

(*e*) FREQUENCY dial tunes amplifier output circuit and has two flick positions.

(*f*) DRIVE ADJUSTMENT (R1A) controls input to amplifier.

(*g*) AERIAL TUNING INDUCTANCE No. 1, figures in index windows indicate number of turns in circuit, therefore high number settings are required for low frequencies.

TECHNICAL FEATURES (Fig. 1001)

AMPLIFIER CIRCUIT

8. On send the output of the Wireless set No. 19 is applied to the input transformer L1A via the line change-over relay contact B1. L1A is an auto-transformer with an iron dust core; it is tuned to approx. 1.6 Mc/s by C11C and the shunt capacity of the amplifier valves. This gives the input circuit a transmission characteristic rising towards the 2 Mc/s end of the band, and corrects for changes of output with frequency from the Wireless set No. 19. R9A is a damping resistance. L1A is coupled to the grids of V1A-D through the condenser C3A and the grid stopper resistances R3A, C, E and G. Control of drive voltage is provided by R1A which acts as variable damping on L1A. The drive voltage is measured by rectifier W2A and meter; the load resistance R2A is varied to adjust the meter indication. The D.C. in this circuit is fed through the meter switch S1A to the low potential end of L1A and then via the relay contacts B1 and the feeder to the Wireless set No. 19 panel meter. C1A is a by-pass condenser.

9. The valves V1A-D are connected in parallel and operate as a straightforward linear R.F. amplifier. The cathodes of the valves are returned to L.T. +ve through R5A, providing a combination of fixed and automatic bias. The screen grids are connected through the anti-parasitic resistances R4A-D to a common H.T. feed resistance R6A and by-passed by C5A. The heaters of V1A-D are connected in series-parallel across the L.T. supply.

10. The anode circuit is tuned by the variable condenser C7A and the coils L4A and L5A. These coils are connected in series on the 2-4.5 Mc/s band. L5A is short-circuited by S2A/3 on the 4.5-7.5 Mc/s band. The anodes of V1A-D are connected through stopper resistances R3B, D, F, H and S2A/1 to taps on the coils L4A and L5A. C5B isolates

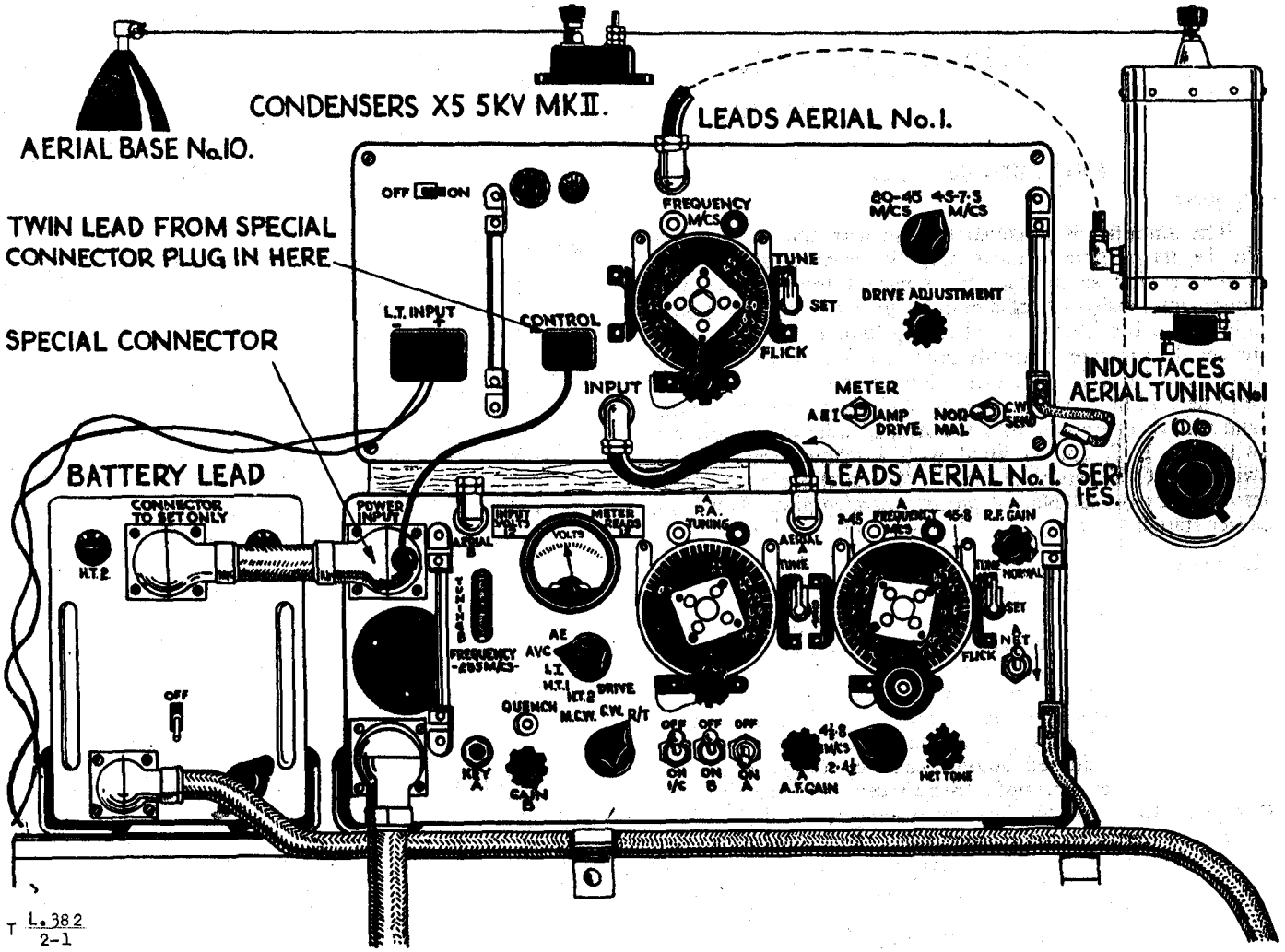

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Fig. 1—Front panel view

the D.C. voltage from the tuning condenser. C6A is a fixed trimming capacity. S2A/2 switches the output tap on L4A or L5A, and feeds the output current, through the D.C. isolating condenser C8A and the aerial current meter transformer No. 3, to the variable inductance which tunes the aerial.

Meter transformers

11. The meter transformer No. 3, T2A, connected in the output circuit, is essentially the same as that used in the Wireless set No. 19 variometer except for the value of the shunt resistance R8A. The output of this transformer is controlled by the pre-set resistance R12A and is fed back via S1A and B1 to the Wireless set No. 19 panel meter.

12. Meter transformer No. 4, T1A, is included in the input circuit to indicate the aerial current of the Wireless set No. 19 when the amplifier is switched off. The D.C. output is fed through the sensitivity control R12B and the limiting resistance R13A to B1, then back to the Wireless set No. 19 panel meter. It is not connected when the amplifier is transmitting.

13. Meter switch S1A selects either the output of meter transformer No. 3 or the D.C. current of the drive rectifier W2A. It is inoperative when the amplifier is switched off.

Send/receive control circuit

14. Send/receive control of the amplifier is obtained by passing the H.T.2 current of the Wireless set No. 19 through the relay coil A/1. This is done by replacing the connector between the normal Wireless set No. 19 supply unit and set with a special connector, in which the H.T.2 lead is broken and brought out to a socket for connection to the amplifier CONTROL plug.

15. When the Wireless set No. 19 is switched to send, by pressel switch or M.C.W. key, the power amplifier valve draws current from the H.T.2 supply and energizes the relay A/1, which completes the circuit through the less sensitive relays B/1 and B/2. The operation of the rotary transformer starter relays C/1 and D/1 is described in para. 19. When energized by operation of contacts A1, the line change-over relay B/2 connects the output of the Wireless set No. 19 to the amplifier input circuit and the aerial tuning inductance to the amplifier output.

16. In the non-energized condition, contacts B1 and B2 connect the aerial tuning inductance through the primary of the meter transformer No. 4 to the Wireless set No. 19, and so allow the receiver to function normally if the pressel switch is released. When the amplifier is switched off the control circuit is inoperative and the Wireless set No. 19 can be used alone as a sender/receiver in the usual way.

POWER SUPPLY

17. The H.T. voltage is provided by a compound-wound rotary transformer, rated for an output of 600V at 250 mA when supplied with 11.5V at the input terminals. C10A, C9B and L8A are included for R.F. filtering. S6A is the ON-OFF switch; this applies the battery voltage to the control circuits and the valve heaters. The four ATS 25 valves V1A-D have their heaters connected in series-parallel; the heaters remain in circuit whenever the amplifier is on and are not switched by the control circuit.

18. The input current to the amplifier on send is approx. 24A; the starter current of the rotary transformer is, however, very much higher, and for this reason two starter relays are used as described in para. 19.

Starter Relay

19. When energized by the control circuit, relay contacts C1 connect the battery voltage to the input of the rotary transformer in series with R10A, which limits the starting current Contacts D1 short-circuit R10A when the armature voltage is great enough to operate the relay D/1, i.e., when the machine is rotating fast enough to reduce the starting current.

C.W. OPERATION

20. To avoid operating the starter relays intermittently when keying C.W., a switch S1B is included, which, in the C.W. SENT position, short-circuits the relay contacts A1 and keeps the rotary transformer running continuously. At the end of the transmission this switch has to be returned to the NORMAL position before the receiver can be operated.

AERIAL TUNING INDUCTANCE

21. The Inductance, aerial, tuning, No. 1 is a variable inductance of the rotating solenoid type; not a variometer. It is fitted with a counter device which indicates the number of turns in circuit. There is no series condenser inside the unit and a high-voltage condenser, Condenser X5, 5kV, Mk. II, is normally installed in vehicle installations to give protection against contact with power lines.

AERIALS

22. The amplifier can be used with most of the aerials normally worked with the Wireless set No. 19, but due to the higher power, special aerial feeders assemblies have to be used and greater care taken to ensure adequate insulation and clearance at high-potential points. The standard Wireless set No. 19 variometer should never be used as it is not designed for high-power working.

23. Vertical rod aerials should be at least 12 ft. in length and in some installations a longer length will be necessary when using frequencies lower than 2.3 Mc/s.

24. Horizontal wire aerials of the type described in Tels. F 252 for the Wireless set No. 19 can be used with the amplifier, provided the lead-in wire is well spaced from the structure housing the installation.

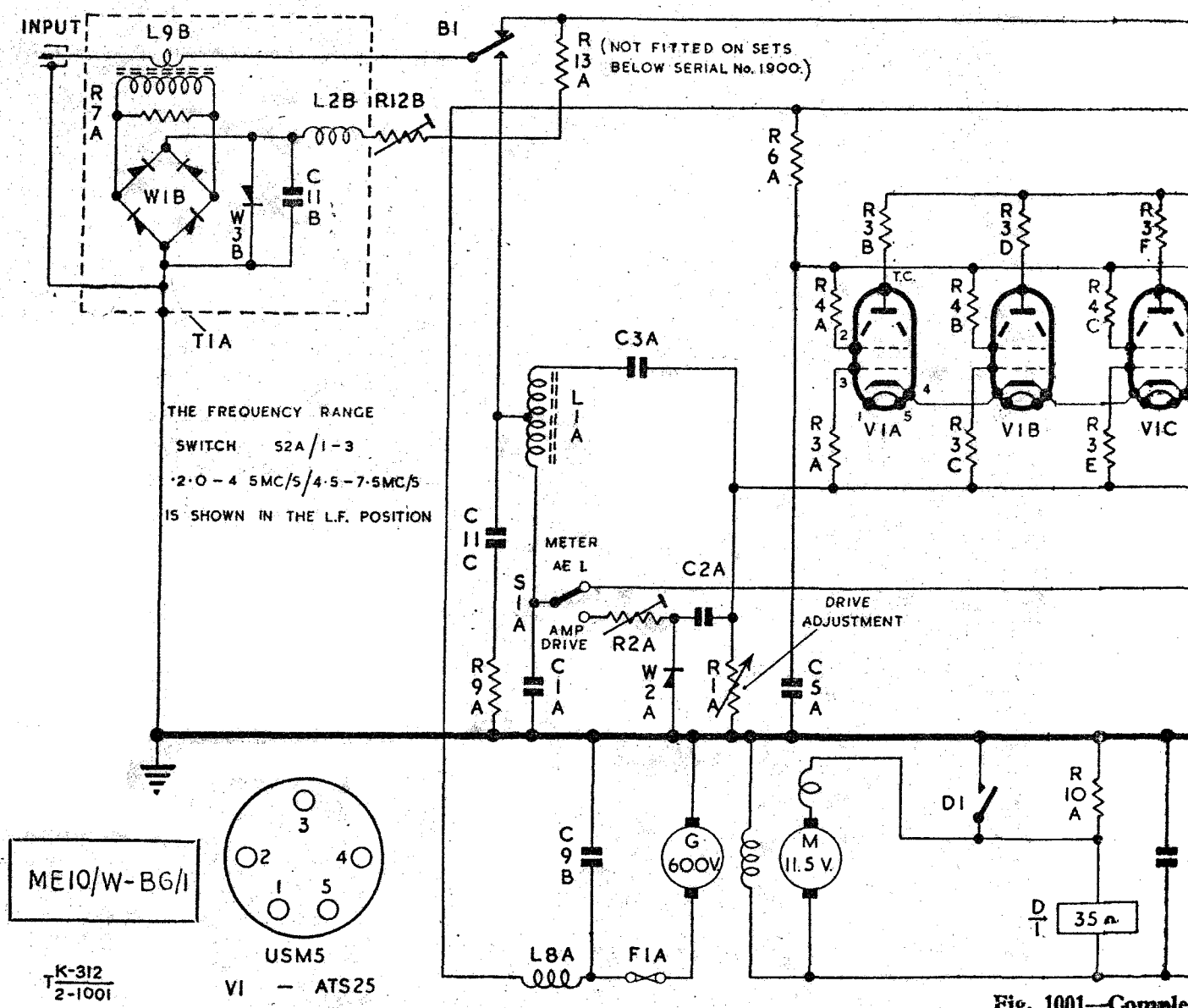

Fig. 1001—Comple

Circuit reference	*Description*
CONDENSERS	
C1A	0.005 ρF, mica, 350V
C2A	100 ρF, Lemco
C3A	0.01 μF, tubular, 350V
C5A-B	0.004 μF, mica, 2.2kV, test
C6A	24 ρF, 2½kV peak wkg.
C7A	19-200 ρF, tank condenser
C8A	0.01 μF, mica, 2.2kV, test
C9A-B	0.1 μF, tubular, 1.5kV
C10A	0.1 μF, tubular, 350V
C11A-C	0.001 μF, mica
C12A	0.01, mica, 350V wkg.
RESISTORS	
R1A	250Ω, variable
R2A	50kΩ, variable
R3A-H	47Ω, ¼W
R4A-D	100Ω, ¼W
R5A	47Ω, 6W, wire-wound
R6A	15kΩ, 12W, wire-wound

Circuit reference	
RESISTORS (cont.)	
R7A	33Ω, ¼W
R8A	3.7Ω, ¼W
R9A	12Ω, 4W
R10A	0.5Ω, wi
R11A	22Ω, ½W
R12A-B	750Ω, va
R13A	470Ω, ¼W
INDUCTANCES	
L1A	Input tra
L2A-B	R.F. cho
Relay coil B/2	Relay co and B/
L4A	H.F. tan
L5A	L.F. tan
Relay coil A/1	Relay co
Relay coil C/1	Relay co
Relay coil D/1	Relay co
L8A	R.F. filte
L9A-B	Meter tra

Table 1001—Details of co

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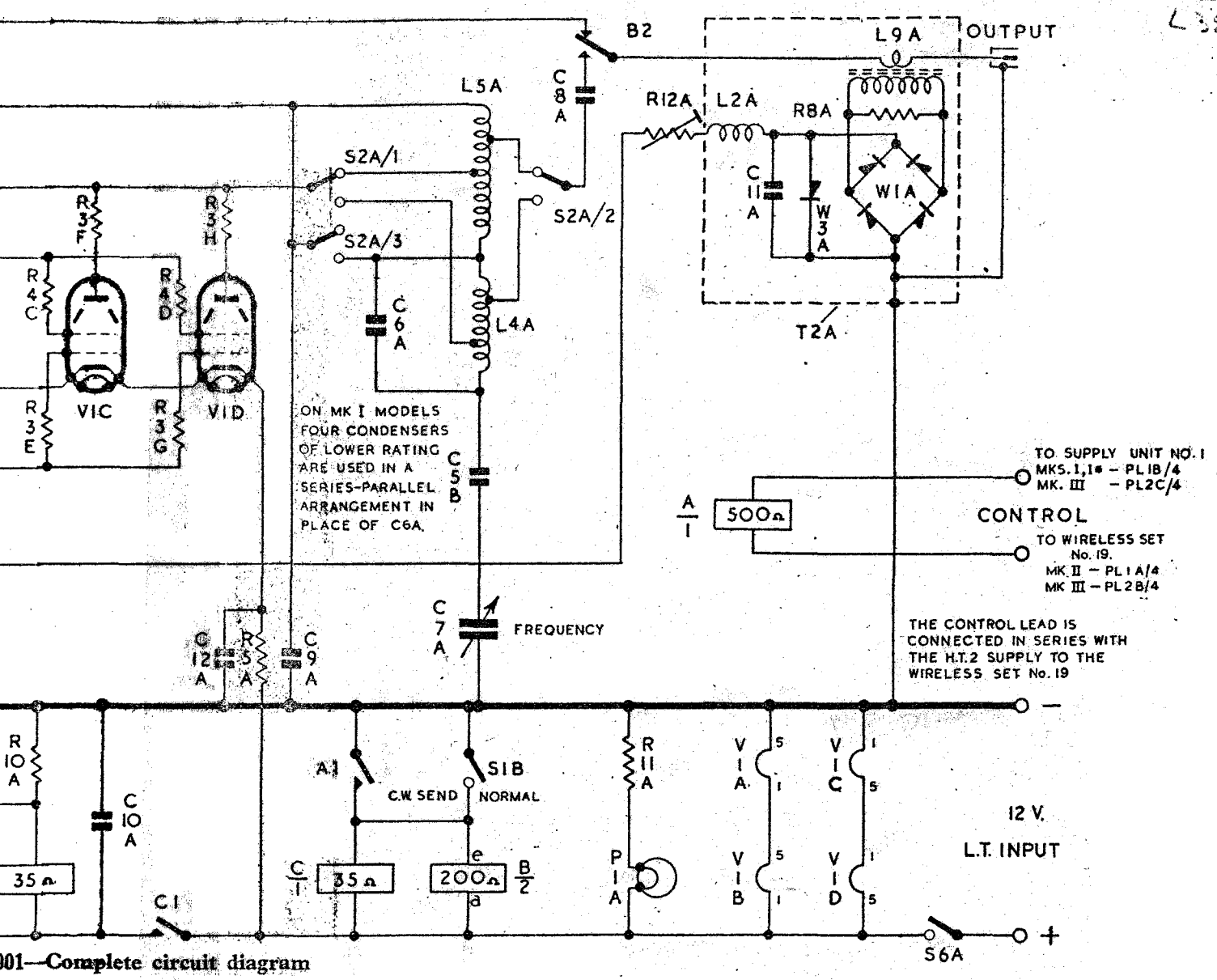


001—Complete circuit diagram

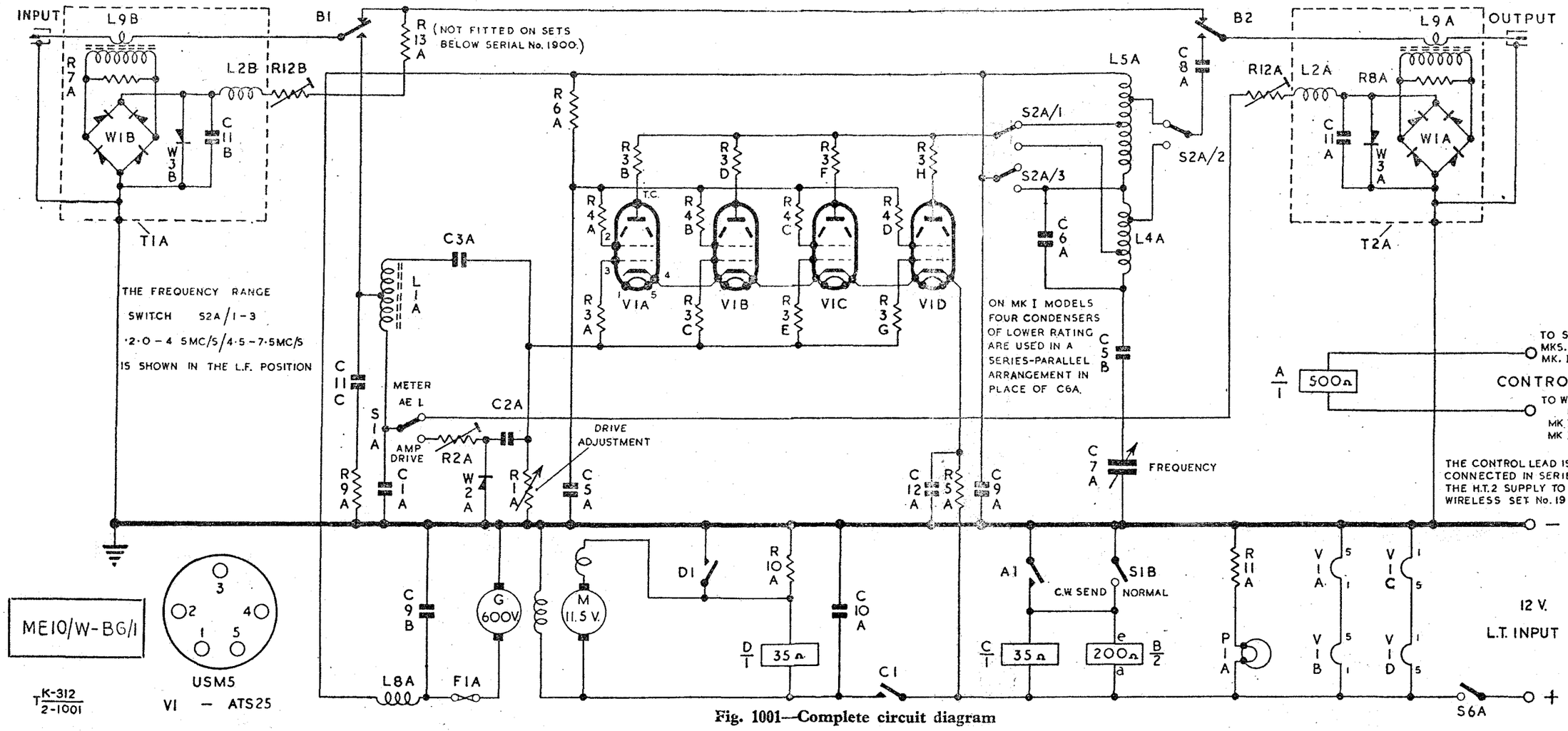
	Description
.1.)	
	33Ω, ¼W
	3.7Ω, ¼W, wire-wound
	12Ω, 4W, wire-wound
	0.5Ω, wire-wound
	22Ω, ¼W
	750Ω, variable
	470Ω, ¼W
	Input transformer
	R.F. choke
	Relay coil controlling contacts B1 and B2
	H.F. tank coil
	L.F. tank coil
	Relay coil controlling contacts A1
	Relay coil controlling contacts C1
	Relay coil controlling contacts D1
	R.F. filter choke
	Meter transformer coil

Circuit reference	*Description*
VALVES	
V1A-D	ATS 25 or ATS 25A
SWITCHES	
S1A	Meter switch
S1B	C.W. SEND/NORMAL switch
S2A/1-3	FREQUENCY range switch
Contacts B1 and B2	Line change-over contacts
Contacts C1	Filament supply control contacts
Contacts D1	Generator starter contacts
Contacts A1	Send/receive control contacts
S6A	ON/OFF switch
RECTIFIERS	
W1A-B	5mA Inst. rectifier
W2A	W.6 Westector
W3A-B	Type SH. 1A rectifier
FUSES	
F1A	½A, 1¼ in. cartridge
LAMPS	
P1A	Lamp 12V signal

Details of components (Fig. 1001)

END

Tels. K 311 is hereby cancelled, having been replaced by Amplifier, R.F., No. 2 Working Instructions ZA 10396.



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Circuit reference	*Description*
RESISTORS (cont.d.)	
R7A	33Ω, ¼W
R8A	3.7Ω, ¼W, wire-wound
R9A	12Ω, 4W, wire-wound
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R13A	470Ω, ¼W
INDUCTANCES	
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L5A	L.F. tank coil
Relay coil A/1	Relay coil controlling contacts A1
Relay coil C/1	Relay coil controlling contacts C1
Relay coil D/1	Relay coil controlling contacts D1
L8A	R.F. filter choke
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