WIRELESS SET CDN. No. 29

DESCRIPTION

This issue cancels Issue 1 of Tels F 352 (C.A.) dated Feb 1945 which has been amended throughout and will be destroyed.

General

Function

1. Wireless Set Cdn. No. 29 is designed for use in armoured fighting vehicles, in various wireless trucks and as a ground station. It is tropicalized and splash-proof.

2. The set has the same overall dimensions and mounting facilities as Wireless Set No. 19 with which it is fully interchangeable in all its installations and applications. The set may be connected into any existing Wireless Set No. 19 or Wireless Set No. 22 control harness and provides the same operational functions. By using its own specialized installation kit even greater functional flexibility is possible.

3. The wireless set comprises the following:—

(a) "A" set—a low power transmitter/receiver providing R/T or C.W. communication over the frequency range of 2 to 8 Mc/s. The "A" set may be tuned automatically on three pre-set channels by means of push-buttons, or may be tuned manually.

(b) "B" set—a low power transmitter/receiver providing R/T communication on either of two fixed channels, 235 and 245 Mc/s.

(c) I.C. amplifier—a low power, A.F. amplifier for intercrew communication.

4. The "B"-I.C. unit may be removed from the station and used anywhere, since it is powered by its own self-contained vibrator supply from any 12 or 24 V. source.

5. The following additional features have been incorporated into the design of the "A" set:—

(a) Remote automatic control from a maximum of 10 feet by means of an extension cable for the removable push-button unit.

(b) Sender output on H.P. approximately 10 times greater than that of the Wireless Set No. 19. The L.P.-H.P. switch is operated by a Yale lock.

(c) Special cover for frequency pre-set adjustments to prevent accidental movement.

(d) Standby operation.

(e) C.W. break-in operation and A.F. sidetone on send, C.W.

(f) Extremely accurate frequency calibration due to semi-crystal control on both receive and send.

(g) An improved noise limiter greatly aiding intelligibility adverse operating conditi

(h) Unit construction of t portions of the circuit servicing.

Description of Components

6. Aerial Tuning Unit No. C2 is a continuously variable inductance used to load artificially to a resonant ¼ wavelength the short aerial systems used by the "A" set. Motor or manual drive may be employed, tuning to resonance being fully automatic when it is motor-driven. Aerial Base No. C20 is provided with a tilting and rotating feature and is used in conjunction with Aerial Rods, F, Sections No. C5, C6 and C7. These rods are tapered tubes, 3 ft. in length, and are fitted together by threaded joints. They are mechanically interchangeable with the 4 ft. "F" sections of Wireless Set No. 19. Two, three or four aerial sections may be used. With less than three aerial sections the A.T.U. will not tune at the lowest frequencies. A 34 ft. vertical mast or horizontal aerial (Kits, Aerial Gear, No. C1) may also be used.

7. Aerial Base No. C4, used with the "B" set, is provided with a tilting feature and is used in conjunction with Sections No. 1 and 2 of Aerial, Dipole No. C1. These combine to form two ¼ wavelength sections, comprising a centre-fed folded ½ wave dipole. A ¼ wavelength stub on the lower section reduces the amplitude of standing waves on the feeder.

8. Microphone and Receiver Headgear Assemblies No. C21 are supplied with the set and are interchangeable with Microphone and Receiver Headgear Assemblies No. C1. The dynamic microphone is fitted with a rubber acoustic shield to reduce noise pick-up, and the dynamic type headphones are mounted in sponge rubber earcushions. The entire assembly is waterproof. The micro-

phone impedance (5 ohms) is matched by a self-contained transformer to the input impedance of the set (50 ohms).

9. Microphone and Receiver Headgear Assemblies No. C22 are for use with Control Unit No. C101 and are provided for the commander only. The microphone (Microphone, Hand No. C6) incorporates an additional sliding switch placed opposite the send-receive switch. This switch is used for BATTLE CONTROL and has two positions marked RADIO and I.C. Use of this switch enables the commander to switch alternately any one selected facility (A, B or D) without the necessity of operating rol unit switch. This assembly is stinguished from Microphone and Headgear Assembly No. C21 by a atch plug.

Control Unit No. C101, normally used by the commander, has three drop cords labelled RADIO, BATTLE CONTROL and I.C. The first two cords are connected to the set selected by the switch on this control unit. Switch positions are marked A, B, I.C. and D. If no "D" set is provided a mechanical stop prevents the switch from being turned to the D position. The drop cord marked BATTLE CONTROL has a white socket and is used with Microphone and Receiver Headgear Assemblies No. C22. This assembly will operate satisfactorily in any control unit socket but will not provide the BATTLE CONTROL feature unless it is connected to the white socket.

11. Control Unit No. C102 contains two drop cords and two switch knobs. The upper switch knob connects the operator to A, I.C., B, D or to retransmit as desired. In the latter case the required service is selected by the lower knob. Facilities are provided for the simultaneous operation of any two sets at the same time, for example, by switching to A & B, signals will be received and speech transmission is possible over both sets. B & D or A & D may be operated similarly. Provision is also made for a listening watch to be kept on two or more receivers, but, when the lower switch knob is turned to the listening position, the sets cannot be operated on send. When switched to the LISTEN ALL position, signals will be heard on "A", "B" or "D" sets.

12. Junctions, Distribution No. C103 used by the driver and co-driver contain two drop cords normally connected to I.C. Link connections are provided inside the box, so that, if necessary, one or both drop cords may be connected to the "A" and/or "B" set.

13. Special provision is made in the circuits of the control system whereby the unattended wireless set automatically feeds through to I.C. This facility may be removed from certain positions as required. The automatic feed-through functions as follows:—

(a) If neither Control Unit No. C102 nor Control Unit No. C101 are on A, the "A" set is heard via feed-through at somewhat reduced level on I.C. If neither are at A or I.C. position, the red lamp on Control Unit No. C102 will light.

(b) If neither control unit is on B or D, the "B" or "D" Set will be heard via feed-through on I.C.

(c) If either control unit is switched to any one of the sets, that set will not feed through to I.C.

14. Junctions Remote Control No. C101 and C102 are designed to permit R/T or C.W. operation up to a distance of 800 yards over D8 cable or equivalent. Junction Remote Control No. C101 is the local unit and is fitted with a red warning light which lights when the remote unit is at send. Operation of any set is possible from the remote unit, Junction Remote Control No. C102, depending upon the position of the switch of the control unit to which Junction Remote Control No. C101 is connected.

15. In tank installations a Microphone Hand Power No. 1 A/T and a Unit, Transformer, Microphone No. 2/T are provided for emergency crew control should the I.C. amplifier become inoperative. Instructions will be heard by the crew in their normal headgear but the crew cannot reply.

16. A hand set, Telephone Hand M.C. No. C1, and a Junction Distribution No. C103 are contained in a case mounted on the rear of the tank for infantry tank working. A button marked CALL COMMANDER is provided on the Junction Distribution No. C103. All crew members connected to I.C. can talk to the outside party without switching. It is also possible for the outside caller to talk over the loud hailing equipment described below.

17. Tank installations include a loud hailing system comprising an Amplifier A.F. No. C1 and two loudspeakers (Loudspeaker Assemblies, PM, 500/16 Ohms, No. C1). This system enables one way communication up to 200 yards, although this range may be reduced to 75 yards in battle noise. A control switch on the amplifier is marked OFF-HAIL-BROADCAST. In the HAIL position, the amplifier is connected to the D position on

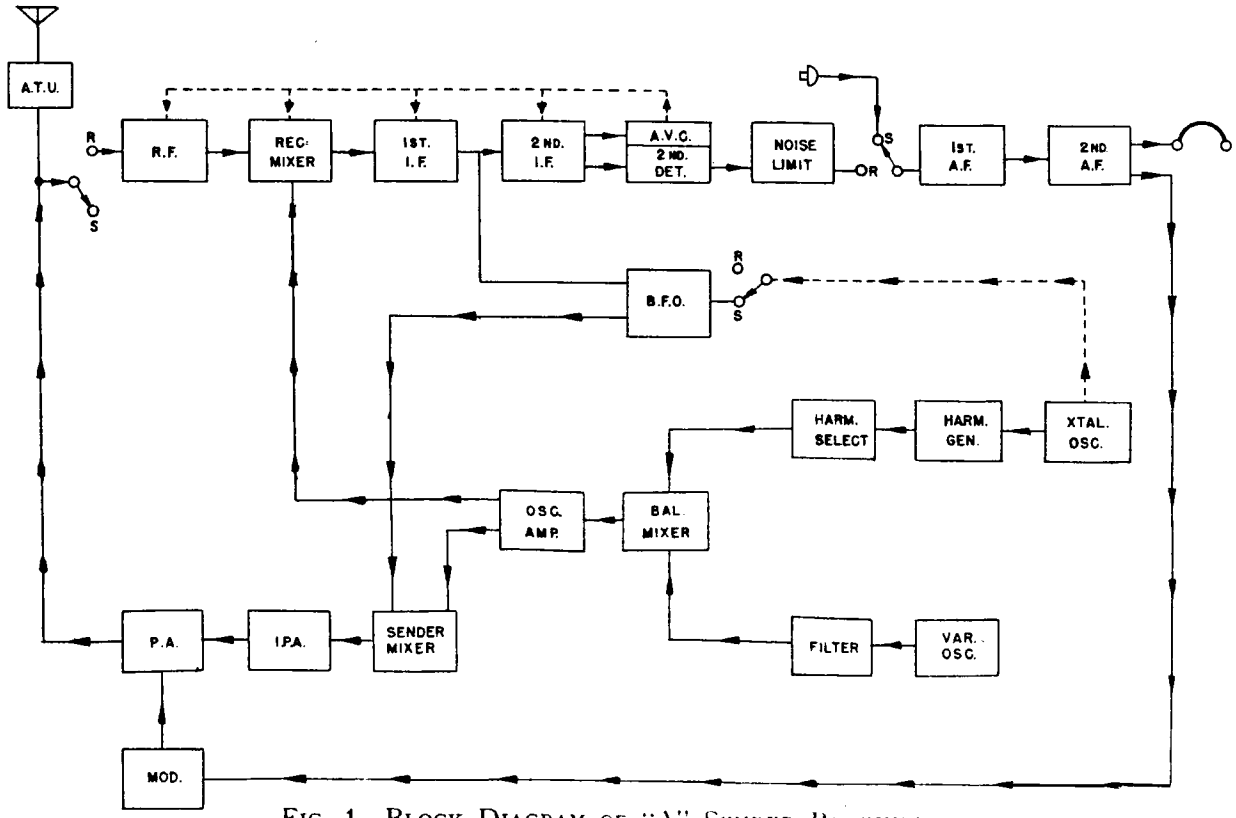
Control Unit No. C101 from which it is possible to broadcast using either Microphone and Receiver Headgear Assembly No. C21 or No. C22. To make this connection possible the "D" Set is disconnected from Control Unit No. C101 but remains connected to Control Unit No. C102. The amplifier is provided with a drop cord to which any standard microphone and receiver headgear assembly may be connected. In the BROADCAST position any of the sets ("A", "B" or "D", on send or receive) can rebroadcast over the loudspeakers by turning the switch on Control Unit No. C101 to A, B or D as required. With Control Unit No. C101 switched to I.C. any member of the crew on I.C. including the operator of the infantry Tank Telephone can broadcast.

The components described in Paras. 6, 7 and 8 are supplied in the standard kit, those described in paras. 9 - 17 incl. are supplied in one or more installation kits.

Brief electrical description

18. The "A" receiver employs a superheterodyne circuit having an intermediate frequency of 1500 Kc/s. It comprises one stage of R.F. amplification, a mixer, two stages of I.F. amplification, a 2nd detector and A.V.C. valve, a series noise limiter and two stages of A.F. amplification. A highly specialized circuit, consisting of crystal and variable oscillators, a harmonic generator and harmonic selector, balanced mixers and an oscillator-amplifier, constitutes in its entirety the conversion oscillator, the output of which is fed to the cathode of the receiver mixer valve. A series I.F. wave-trap shunts the plate circuit of the R.F. stage. Delayed A.V.C. voltages are fed to the R.F. amplifier, mixer and 1st I.F. amplifier stages. A tuneable 500 Kc/s. B.F.O. is provided for C.W. reception, the 3rd harmonic of 500 Kc/s. being employed. On C.W., A.V.C. is removed and a negative bias determined by the setting of the R.F. GAIN control is applied to the A.V.C.- controlled valves. The two A.F. stages and the aerial tuning unit are common to both receiver and sender.

19. The receiver conversion oscillator also serves as the sender master oscillator. The oscillator-amplifier stage is followed by the sender mixer stage where the 3rd harmonic of the B.F.O. is introduced and mixed producing a difference beat frequency identical to that to which the receiver is tuned. An intermediate power amplifier drives the power amplifier which is plate modulated on R/T, the cathode circuit being keyed on C.W. On send, the B.F.O. is locked to the crystal oscillator to ensure that the frequency is maintained at exactly 500 Kc/s. The modulator is driven through the common A.F. amplifier.



DME 85131

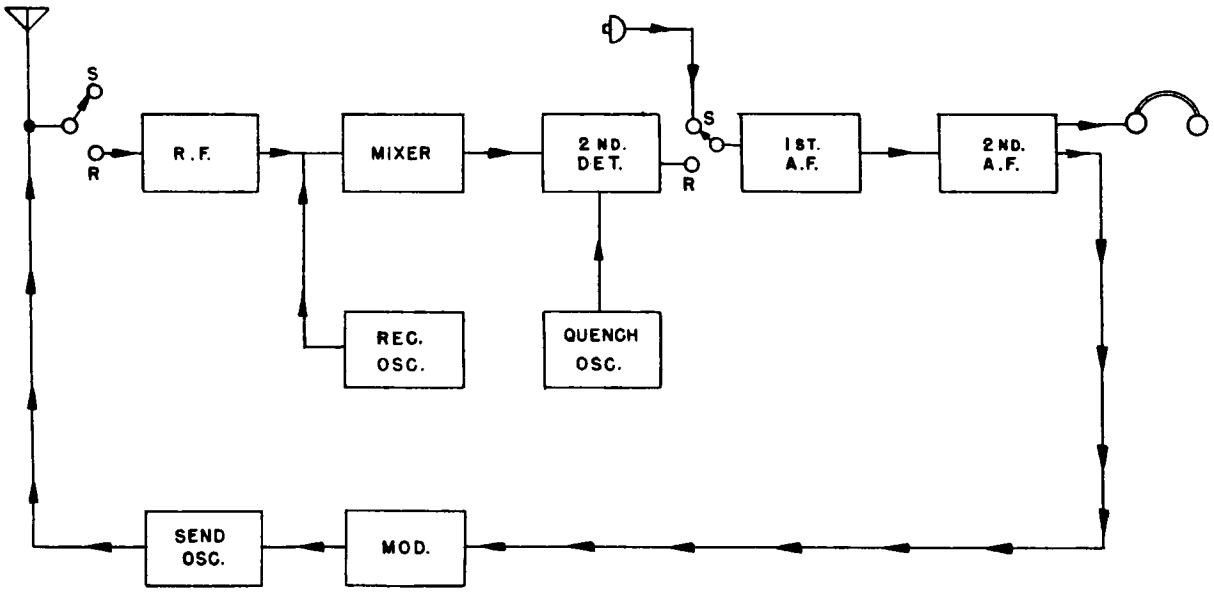
FIG. 1—BLOCK DIAGRAM OF "A" SENDER RECEIVER

20. The "B" receiver is a superheterodyne circuit with an intermediate frequency of 70 Mc/s. It comprises a stage of R.F. amplification and a mixer with a separate lecher-bar oscillator. The I.F. channel consists of a superregenerative 2nd detector with a separate 48 Kc/s. quench oscillator. Two stages of A.F. amplification are common to both receiver and sender.

21. The "B" sender comprises a plate-modulated, lecher-bar oscillator. The modulator is driven by the common, two-stage, A.F. amplifier.

22. The I.C. amplifier is a two-stage, resistance-capacity coupled A.F. amplifier.

23. The set is powered by accumulators using either a 12 V. or 24 V., 2-wire system. Two rotary transformers in the supply unit provide H.T. 1 (150 V.) and H.T. 2 (400 V.) for the "A" set. H.T. for the "B" set and I.C. amplifier is supplied by a separate 150 V. vibrator supply contained in the "B"-I.C. unit.



DME 85130 FIG. 2—BLOCK DIAGRAM OF "B". SENDER/RECEIVER

TABLE 1—APPROXIMATE L.T. CURRENT DRAIN

Type of Operation	Current Drain in Amperes	
	12 V.	24 V.
"A" set, Standby	4.9	2.5
"A" set, Receive R/T	7.0	3.75
"A" set, Receive C.W.	11.5	6.0
"A" set, Send R/T, unmod., L.P.	16.75	9.25
"A" set, Send R/T, unmod., H.P.	19.5	10.75
"A" set, Send R/T, 100% mod., L.P.	19.5	11.0
"A" set, Send R/T, 100% mod., H.P.	23.5	13.0
"A" set, Send C.W., L.P.	15.75	8.25
"A" set, Send C.W., H.P.	17.75	9.75
"A" set, Send, automatic tuning	24.5	14.0
"A" set, Send, A.T.U. searching	17.25	9.5
"B" set, Receive	3.5	1.9
"B" set, Send	3.75	2.3
I.C. only	2.7	1.65
I.C. + "B" set, Receive	3.65	2.0
I.C. + "B" set, Send	3.9	2.35

Brief mechanical description

24. The "A" set is mounted on one chassis contained in an aluminium alloy case. The "A" supply unit (Supply Unit Cdn. Type 29) is contained in a separate case. Both units have 22-point sockets on the rear apron which, when the units are placed in their respective cases, contact the plugs of an external, 22-point, waterproof connector through openings in the rear of each case. The "B" set and I.C. amplifier together with the vibrator supply are contained in a third aluminium alloy case. These units are rainproof but not immersionproof.

25. The sectional carrier is provided with shock mounts and is equipped with a quick release mechanism. All three units are mounted on this carrier which provides for three optional mounting assemblies to suit different installations. The automatic tuning unit and control units are mounted separately in locations dependent upon the specific installation.

TABLE 2—CONTROLS AND THEIR FUNCTIONS

Unit	Panel Designation	Circuit Ref.	Function
"A"	CHANNEL 1 2 3	S210 S211 S212 S213	Push-button operated switches for automatic control of the "A" set on three pre-set channels.
	GAIN	R210 R211	A.F. gain control on R/T, R.F. gain control on C.W., both ganged on one shaft.
	C.W. KEY	J140	Key jack, protected by waterproof cover.
	R/T C.W.	S141A-B-C C149	Ganged R/T-C.W. switch and heterodyne tone control.
	OSCILLATOR	C57	500-1000 Kc/s. oscillator tuning condenser.
	SELECTOR FREQ MC	S100A-B-C-D	Main selector switch in harmonic selector circuit.
	PRESET 1 2 3	S101 S102 S103	Pre-set switches for automatic operation, working in conjunction with push-buttons.
	A.T.U. MOTOR	S143	Double pole switch in circuit between L.T. and A.T.U. and between control relay coil and control valve, V2D.
	R.F. TUNING	C200A-B-C-D-E	Ganged condenser tuning 1st R.F. amplifier, I.P.A., sender mixer and oscillator-amplifier circuits.
	LOW-HIGH POWER	S140	Switches "A" sender from low to high power operation.
	TRAFFIC	P140	Pilot lamp indicating when "A" set is on TRAFFIC.
S.U.	STANDBY—OFF—TRAFFIC	S220	4 P.D.T. switch in L.T. input circuit. On STANDBY only the receiver heaters and low power dynamotor are connected.
	ANT-DRIVE-AVC-LT HT1-HT2	S224	Meter switch for measuring aerial current on send, R.F. drive to P.A., A.V.C. action, L.T. and H.T. voltages respectively.
	SET FOR 12 V. 24 V.	S222	Switches primary windings of both dynamotors in series for 24 V. operation, in parallel for 12 V. operation.

TABLE 2—CONTROL AND THEIR FUNCTIONS—Cont'd.

Unit	Panel Designation	Circuit Ref.	Function
"B"	B GAIN	R516	Controls A.F. gain between 2nd detector and 1st A.F. amplifier.
	CHANNEL	S500	Shunts trimmers across receiver and sender oscillators to change frequency when switching from Channel 5 to Channel 4.
	ON—B	S571	"B" set ON-OFF switch. Controls the L.T. to the vibrator and the "B" I.C. heater net, and switches the H.T. from the vibrator to the "B" set.
	ON—I/C	S572	I.C. ON-OFF switch. Controls the L.T. to the vibrator and the "B"-I.C. heater net, and switches the H.T. from the vibrator to the I.C. amplifier.
	SET FOR 12 V. 24 V.	S570	Switches vibrator transformer primary windings in series for 24 V. operation, in parallel for 12 V. operation.

TECHNICAL

"A" SET (FIG. 1003)

Aerial circuit

26. The "A" aerial is tuned on both send and receive by the aerial tuning unit, L192, a continuously variable inductance. The aerial circuit has a "Q" of approximately 150 and, when terminated by the correct aerial impedance (50 uuF. and 10 ohms), the gain on receive is between 8 and 10. A twinax feeder connects the A.T.U. to the aerial terminal socket, S0141, on the "A" set. The input from S0141 is connected via transformer T142 to terminal 7 of S100B (front), to the plate circuit of V5B, and to the keying relay S142. The SELECTOR FREQ MC switch S100B, connects one of the fixed condensers, C130, C131, C132, C133, C134 or C135, to ground and by connecting the grid of V1A to this low impedance point a greatly improved signal to noise ratio is obtained.

R.F. chassis

27. A.V.C. voltages are shunt fed through a filter to the control grid of the receiver R.F. amplifier, V1A (6AG5). L2 and C7 form a series resonant wave trap from plate to ground, tuned by C7 to the I.F. (1500 Kc/s.).

28. The output of V1A is coupled to the control grid of the receiver mixer, V1B (6AG5), by the R.F. transformer, L1A-L1B. C2 provides frequency compensation for flat response over the band. A.V.C. voltages are shunt fed through R5 to the control grid and C8 is the A.V.C. blocking condenser. The output of the conversion oscillator is applied to the cathode of V1B. R8 prevents spurious oscillations which might occur since neither control grid nor cathode is grounded. L1B, which has an adjustable, powered-iron core, is tuned over the frequency range of 2 - 8 Mc/s. by C200A, a section of the main R.F. ganged condenser. C3 is the mixer trimmer.

29. The intermediate frequency is selected in the plate circuit of V1B by a permeability-tuned circuit comprising L3A and C11. Due to sub-chassis construction and physical layout, a coaxial cable is used to connect the output from the permeability-tuned secondary, L3B, to the I.F. chassis. To match the impedance of the coaxial cable, a low impedance capacitive tap is provided on L3B.

30. H.T., L.T., bias and A.V.C. voltages are fed to the R.F. chassis by a 4-wire cable.

I.F. chassis

31. V1C (6AG5) is the 1st I.F. amplifier. L20A, the primary of the 2nd I.F. transformer, is provided with a low impedance, capacitive tap to match the impedance of the coaxial cable. L20B is the secondary of the 2nd I.F. transformer. This extra, double-tuned circuit, necessitated by the coaxial cable, increases the I.F. selectivity. A.V.C. voltages are applied to the control grid through L20B, and R34 and C38 comprise the A.V.C. decoupling network. The cathode resistor, R35, is not by-passed to minimize input cir-

cuit resonant frequency shift due to variations in the A.V.C. voltages. The test meter in the supply unit gives an indication of the A.V.C. action by measuring the voltage developed across R22.

32. The 2nd I.F. amplifier, V1D (6GA5), is conventional except that the plate and screen grid are by-passed to cathode and not to ground. R23 provides cathode bias and is by-passed to ground by C26. No A.V.C. voltage is applied to this stage. B.F.O. voltages are applied to the control grid through C34, resulting in a fairly constant output on C.W. even with large changes in signal strength.

33. The 2nd detector and A.V.C. valve, V2A (6J6), is a double triode. The plate and grid of each section is strapped and the valve operates as a double diode with a common cathode. The amplified signal from V1D is coupled to the detector diode by the 4th I.F. transformer, L22A-L22B. R26 and R27 form the diode load and the rectified signal taken from the junction of these two resistors is applied to the plate of the noise limiter, V2B.

34. The signal from the 2nd I.F. amplifier is also applied through C32 to the right hand diode section of V2A. The cathode of this valve is connected to the junction of R28 and R29 which form a bleeder network between +12 V. and ground, thus biasing the cathode 8 V. positive with respect to ground for delayed A.V.C. action. The A.V.C. diode load resistor, R31, is grounded on R/T at terminal 1 of S141A. R30 and C33B form the A.V.C. filter.

35. The series noise limiter, V2B (6J6), is connected as a double diode.

36. If an unmodulated carrier is being received driving point A (Fig. 3) 10 V. negative, then point B will be —5 V., D.C., since R26 and R27 are of equal value. Thus the plate of V2B (1) will be —5 V.; the cathode will be —10 V., since it is connected to piont A through R33 and R32; and V2B (1) will conduct.

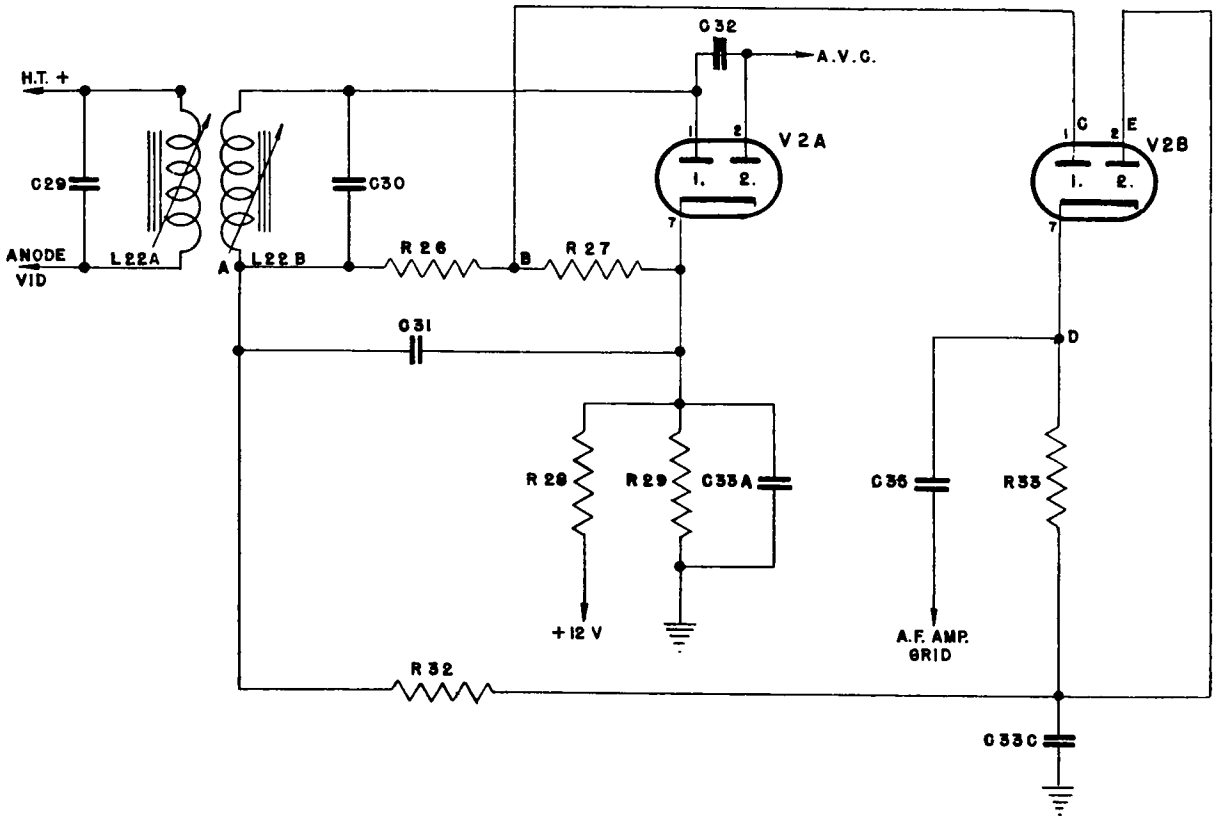
37. If the carrier is modulated 100%, the the peak voltage will rise to —10 V. at points B and C. However, point D will remain at —10 V. due to the A.F. filter, R32, R33 and C33C. Therefore, V2B (1) will continue to conduct and the A.F. developed across R33 is applied to the A.F. gain potentiometer, R210.

38. If the carrier modulation now rises above 100% due to an instantaneous noise pulse, the peak volts at B and C will rise correspondingly, making them more than 10 V. negative, while D remains at a constant average of —10 V. Point C is now negative with respect to piont D for the duration of the pulse, V2B (1) diode is cut off and no signal is fed to the A.F. amplifier.

39. As R32 and C33C form a partial A.C. shunt across R26, the total impedance of R26 is effectively less than that of R27. Therefore, the limiter actually commences to work at approximately 80% modulation. This in no way affects intelligibility.

40. If the receiver is not tuned to a carrier, weak noise pulses ordinarily might be heard since V2B (1) would conduct slightly due to space charge. To prevent this, point C is made slightly negative with respect to point D, causing V2B (1) to be cut off. This voltage is supplied by the contact potential developed by V2B (2) across R33.

41. When a signal is tuned in, point A is negative with respect to point B, V2B (1) is conducting and point C is at approximately the same potential as point D. Point E is negative with respect to point D and V2B (2) is cut off. When a noise pulse representing more than 80% modulation is received, cutting off V2B (1), the potential at point D is no longer determined by point C and V2B (2) immediately starts to conduct. For the duration of the noise pulse the low impedance of V2B (2) in series with C33C is shunted across the input to the A.F. amplifier adding its effectiveness to the series limiter.



DME 85174 FIG. 3—SECOND DETECTOR AND NOISE LIMITER

A.F. chassis

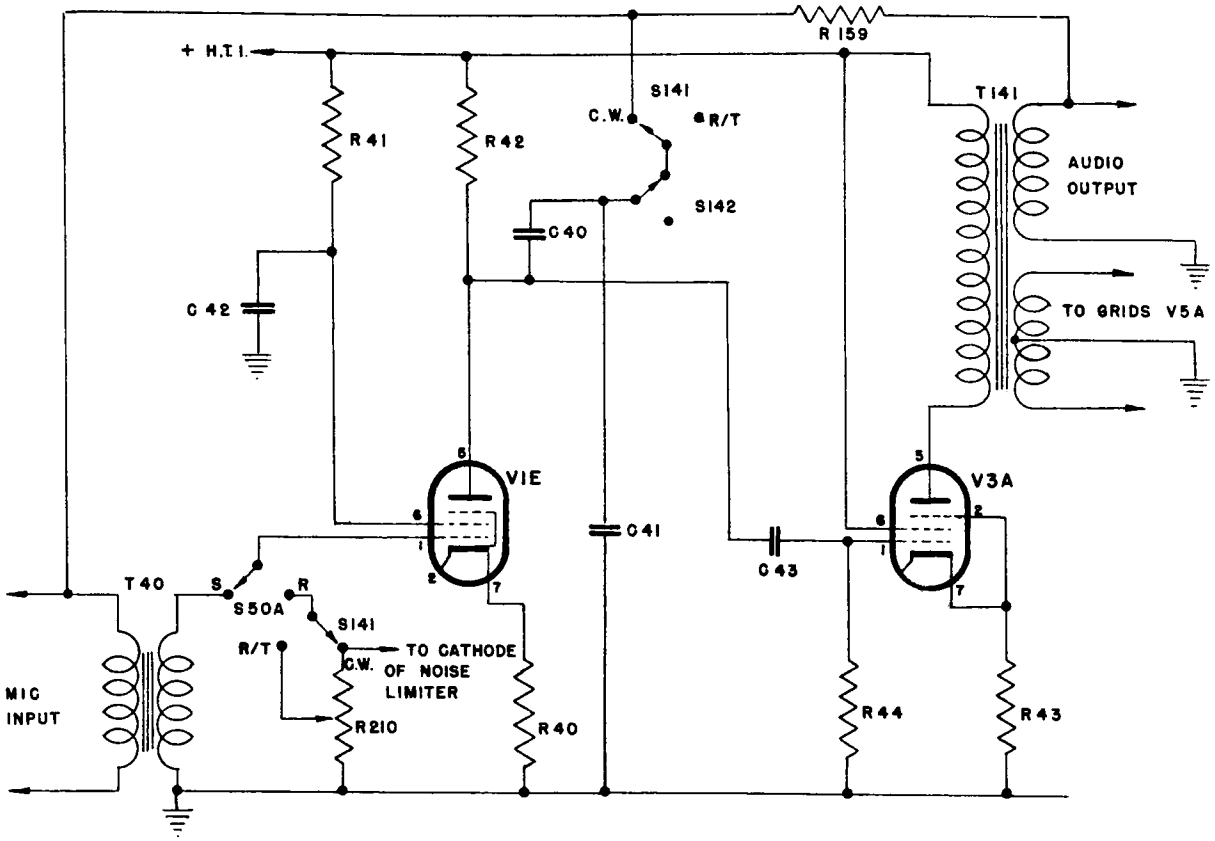
42. The 1st A.F. amplifier, V1E (6AG5), is resistance-capacity coupled to V3A (6AK6), the A.F. output stage. The A.F. channel is common to both sender and receiver, functioning as an A.F. amplifier on receive, a microphone amplifier on send R/T, and a sidetone A.F. oscillator on send C.W. Microphone transformer, T40, has a step-up ratio of 1 : 50 with 50 ohms input impedance. T141 the output transformer, has two secondary windings. The single-ended winding is connected to the headphones providing A.F. output on receive and sidetone on send. This winding is also connected through R159 to the high potential side of T40 primary providing negative feedback on send. The double ended secondary of T141 is used to drive the push-pull modulator on send R/T. On send C.W., V1E is connected as an audio oscillator to provide a sidetone note of approximately 900 c/s. when the sender is keyed.

Oscillator chassis

43. One section of the double-triode valve, V2C (6J6), is used as a crystal oscillator operating at a frequency of 1000 Kc/s. ±.01%. The plated type crystal is held in a special shock mount in a sealed container similar in construction to a metal valve. The plate load, L50, is non-resonant in order to achieve uniform frequency stability in all sets. (If L50 were resonant, the added excitation would cause crystal heating and frequency shift). The oscillator plate potential is 100 V. and 30 V., r.m.s. of R.F. are developed across L50. C52 couples the plate circuit to the grid of the second triode section. On send, C74 couples the plate circuit to the grid of the B.F.O. (See Para. 52).

44. The second triode section of V2C is connected as a harmonic generator designed to amplify all harmonics from the third to the tenth inclusive. This is accomplished by keeping the valve operating angle very small and by using a resonant plate circuit whose impedance rises as it is tuned to progressively higher harmonics. In a circuit of constant impedance the harmonics would tend to decrease in amplitude progressively from the third to the tenth. The plate voltage of V2C (section 2) is 30 V. and approximately 40 V. bias is developed across R51.

45. The harmonic selector circuit comprises L51A, permeability-tuned to 3 Mc/s. and



DME 85167

FIG. 4—A.F. CHASSIS

shunted by C112 and C113. Suitable condensers selected by S100C, a wafer of the SELECTOR FREQ MC switch, resonate the circuit to the desired harmonic. The range of the trimmers is limited so that it is impossible to select any but the desired harmonic. L51A is inductively coupled to L51B.

46. The 500-1000 Kc/s. variable oscillator V1G (6AG5) employs an electron-coupled Hartley circuit. The oscillator tank circuit comprises L52, wound on a ceramic former for maximum stability and having a small powdered-iron core for minor adjustments, tuning condenser C57, air trimmer C56 and temperature compensator C55. To ensure good tracking, tuning condenser C57 rotates through 155° only, 10° at the L.F. end and 15° at the H.F. end are not used. Calibration is very accurate, the maximum permissable error being $\pm$400 c/s. To remove harmonics, the oscillator output is fed through a low pass filter having a sharp cut-off just over 1000 Kc/s., and a low pass impedance of 1000 ohms.

47. The filtered oscillator output is applied through R59 to the cathode of V1K and to the high potential end of L64A. V1F and V1K (6AG5) are used in a push-pull balanced mixer circuit. L64A-B, the cathode coupling coil, is a bi-filar coil with a very high distributed capacity and low "Q". Since the coefficient of coupling of this coil is unity, the voltages applied to the cathodes of V1F and V1K will be equal and 180° out of phase. R60 is a damping resistor used to remove any resonant peaks.

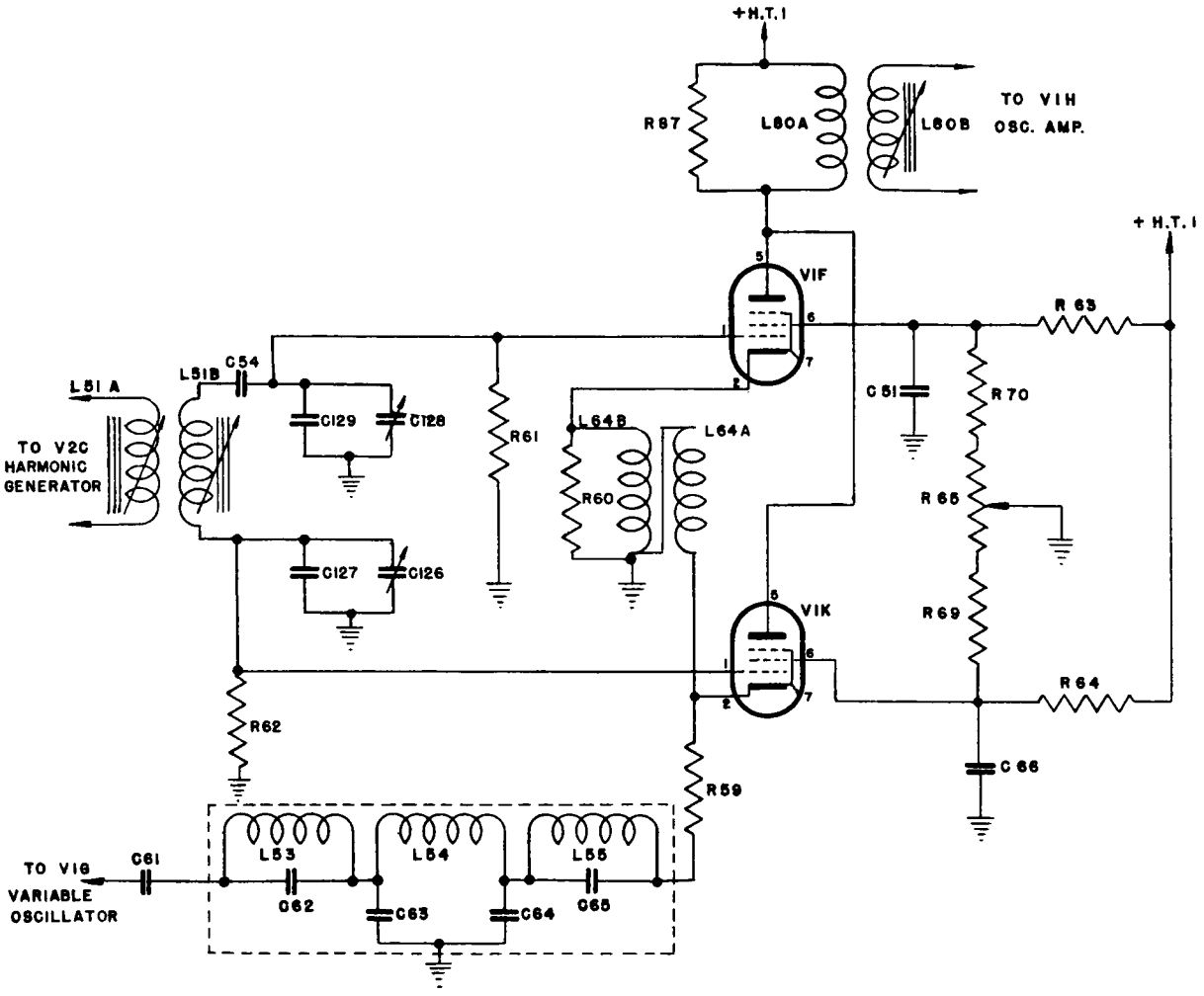
48. The output of the harmonic generator, V2C, is coupled through L51A-B to the control grids of V1F and V1K. The signals applied to each grid are of equal amplitude and are 180° out of phase, L51B being electrically centre-tapped by C126, C127, C128 and C129. C126 and C128 tune L51B to resonance at 10 Mc/s. C127 and C129 are unequal in value to compensate for the additional stray capacity to ground caused by the trimmer condensers being connected to the C127 side of L51B. C54 is a D.C. grid blocking condenser. S100D, a wafer of the SELECTOR FREQ MC switch, shunts suitable condensers and trimmers across L51B to resonate it to the desired harmonic. At 3 Mc/s. C114 is shunted across the coil which is permeability-tuned to resonance. The range of all trimmers is limited so that it is

impossible to select any but the desired harmonic.

49. The plates of the balanced mixers are connected in parallel and the output consists of the sum and difference frequencies only, the parent frequencies being cancelled out. Potentiometer R65 in the screen bleeder network is used to compensate for unequal valve amplification. The output is applied to L80A on the oscillator-amplifier chassis.

B.F.O. with the crystal oscillator. The double permeability-tuned plate circuit L57A-B selects the third harmonic (1500 Kc/s.). From L57B, a low impedance capacitive tap connects through C34 to the grid of V1D, the 2nd I.F. amplifier.

52. On receive, C69 in series with the heterodyne tone control, C149, is shunted across L56. On send fixed condenser C75 is sub-

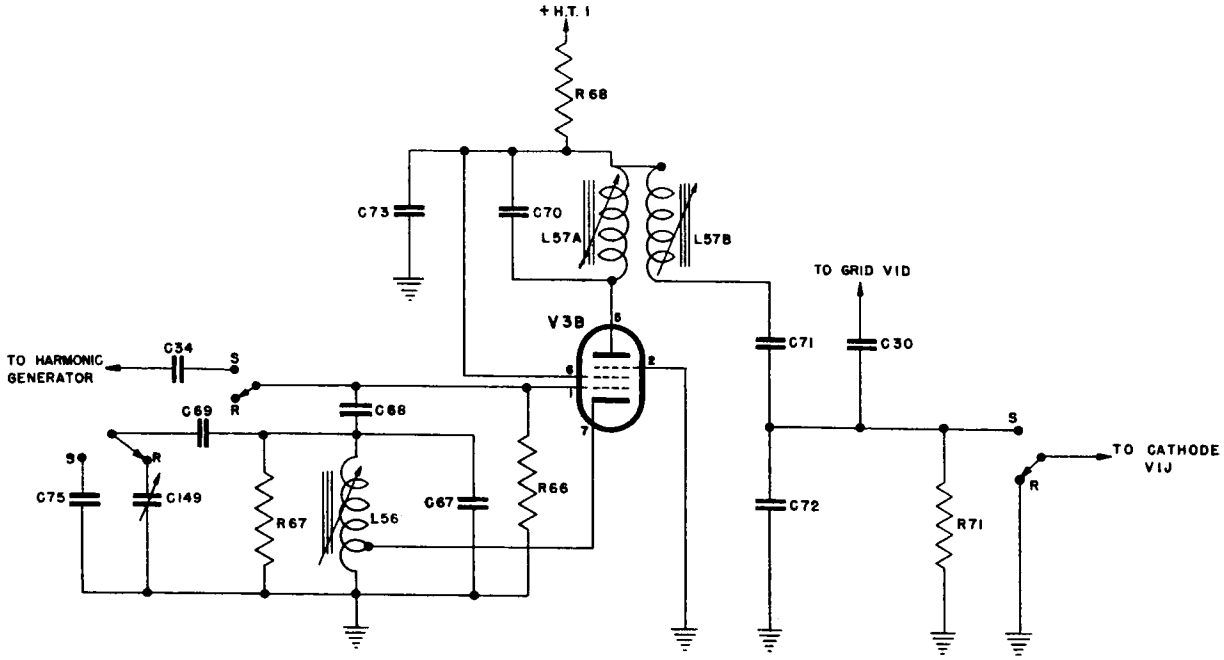


DME 85175 FIG. 5—BALANCED MIXER CIRCUIT

50. The B.F.O., V3B (6AK6), is used in an electron-coupled Hartley circuit, and operates at a frequency of 500 Kc/s. L56 is permeability-tuned and shunted by C67. The cathode tap at the centre of the coil provides sufficient feedback for harmonic generation.

51. R67 shunted across L56 lowers the "Q" of the coil and facilitates "locking-in" of the

stituted for the variable condenser C149, and the grid of V3B is connected through S50B and C74 to the plate of V2C, locking in the B.F.O. with the crystal oscillator for frequency stability. The output of the B.F.O. is applied through S50B to the cathode of V1J.



DME 85169 FIG. 6—BEAT FREQUENCY OSCILLATOR, V3B.

Harmonic selector chassis

53. The principal components on this chassis are:—

(a) Three channel preset switches, S101, S102 and S103.

(b) Stepping relay, L100 and S104.

(c) SELECTOR FREQ MC switches, S100A-B-C-D. The rotors of these switches are moved counterclockwise in 30° arcs by the stepping relay.

(d) The ceramic trimmers and fixed mica condensers, C100-C129 inclusive, used in the harmonic selector circuit.

(e) Fixed mica condensers, C130 to C135 inclusive, used in conjunction with S100B.

Oscillator amplifier chassis

54. The output of the balanced mixers, V1F and V1K, is coupled to the grid of the oscillator amplifier, V1H (6AG5), by R.F. transformer, L80A-B. Damping resistor R87 eliminates resonant peaks in L80A. In addition to the inductive coupling between L80A and L80B, capacity coupling by C93 is employed for H.F. compensation. C200E, section 5 of the R.F. TUNING gang, tunes this circuit from 3.5 to 9.5 Mc/s. (1500 Kc/s. higher than the normal receiver tuning range). L80B is permeability-tuned at 3.5 Mc/s. and trimmer C82 resonates the circuit at the H.F. end of the band. C81 is a series padder. The grid blocking condenser, C83, with C95 forms a voltage divider.

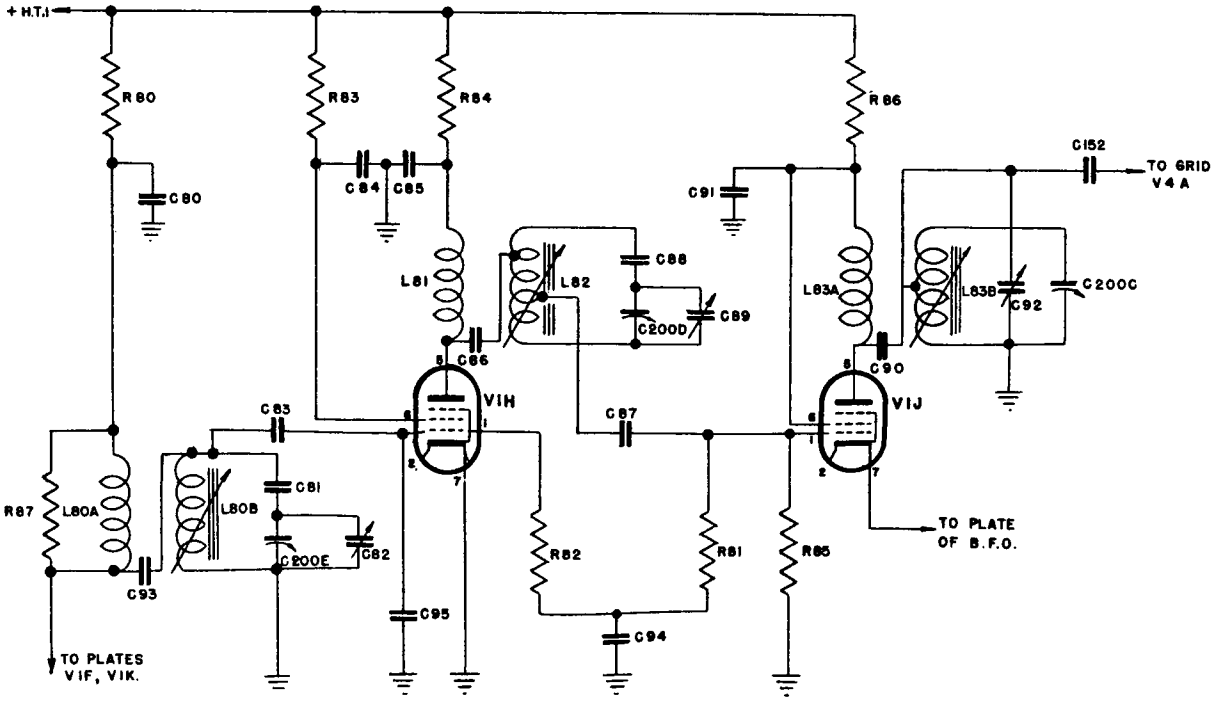
55. V1H is a straight amplifier with the plate circuit tuned to the grid frequency and aligned accordingly. It gives little voltage gain but provides the desired selectivity and power output. R.F. choke, L81, is the plate load, the plate being capacitively-coupled through C86 to L82. C86 is tapped down on L82 to lessen the damping effect and to improve stability. The tuned circuit comprises L82 and C200D, section 4 of the R.F. TUNING gang and is similar to the grid circuit. The output taken from a low impedance tap on L82 is fed through a coaxial cable to the cathode of the receiver mixer, V1B. The same tap on L82 couples the amplifier output through C87 to the control grid of V1J. The voltage developed across R85 due to V1J grid rectification is fed back through R81 and R82 to the control grid of V1H providing automatic drive control. R81 and R82 together with C94 form an R.F. filter.

56. The input to V1H consists of either the sum or difference beat frequency from the balanced mixer depending upon the operating frequency. (See Table 3).

TABLE 3—MIXER FRENQUENCIES

Operating Frequency	Harmonic Selector Switch Position	Harmonic Used	Beat Freq. Used	Bal. Mixer Output Freq.
2.0—2.5	2.	3	Sum	3.5—4.0
2.5—3.0	2.5	5	Difference	4.0—4.5
3.0—3.5	3.	4	Sum	4.5—5.0
3.5—4.0	3.5	6	Difference	5.0—5.5
4.0—4.5	4.	5	Sum	5.5—6.0
4.5—5.0	4.5	7	Difference	6.0—6.5
5.0—5.5	5.	6	Sum	6.5—7.0
5.5—6.0	5.5	8	Difference	7.0—7.5
5.0—6.5	6.	7	Sum	7.5—8.0
6.5—7.0	6.5	9	Difference	8.0—8.5
7.0—7.5	7.	8	Sum	8.5—9.0
7.5—8.0	7.5	10	Difference	9.0—9.5

57. V1J is the sender mixer. The output of the oscillator amplifier is applied to the control grid of V1J as described in Para. 55. On send, the 3rd harmonic of the B.F.O. is applied to the cathode of V1J through S50B. Since the voltage applied to the cathode is approximately 0.5 V. while that applied to the control grid is 1—1.5 V., harmonic generation is minimized. The output of the sender mixer is applied to the control grid of the intermediate power amplifier, V4A (6AG7), by R.F. transformer, L83A-B. C90 provides H.F. compensation. L83B is tuned over the frequency range of 2—8 Mc/s. by C200C, section 3 of the R.F. TUNING gang. L83B is permeability-tuned at the L.F. end of the band and C92 is the H.F.trimmer. The output lead is tapped down on L83B in order to reduce the effect on the plate circuit of distributed capacity in this lead.



DME 85173 FIG. 7—OSCILLATOR AMPLIFIER AND SENDER MIXER

Intermediate power amplifier

58. Approximately 2—3.5 V. of R.F. are applied to the control grid of the I.P.A. by C152. R143 provides cathode bias for this valve. H.T.1 is shunt fed to the plate through R.F. choke L140. R152 and C151 serve as a plate decoupling network. The plate is connected through C142 to a tap on L141, the plate being tapped down on L141 for impedance matching and to reduce the shunting effect of the interelectrode capacities. L141 is tuned by C200B, section 2 of the R.F. TUNING gang. L141 is permeability-tuned at the L.F. end of the band, while C143 is the H.F. trimmer.

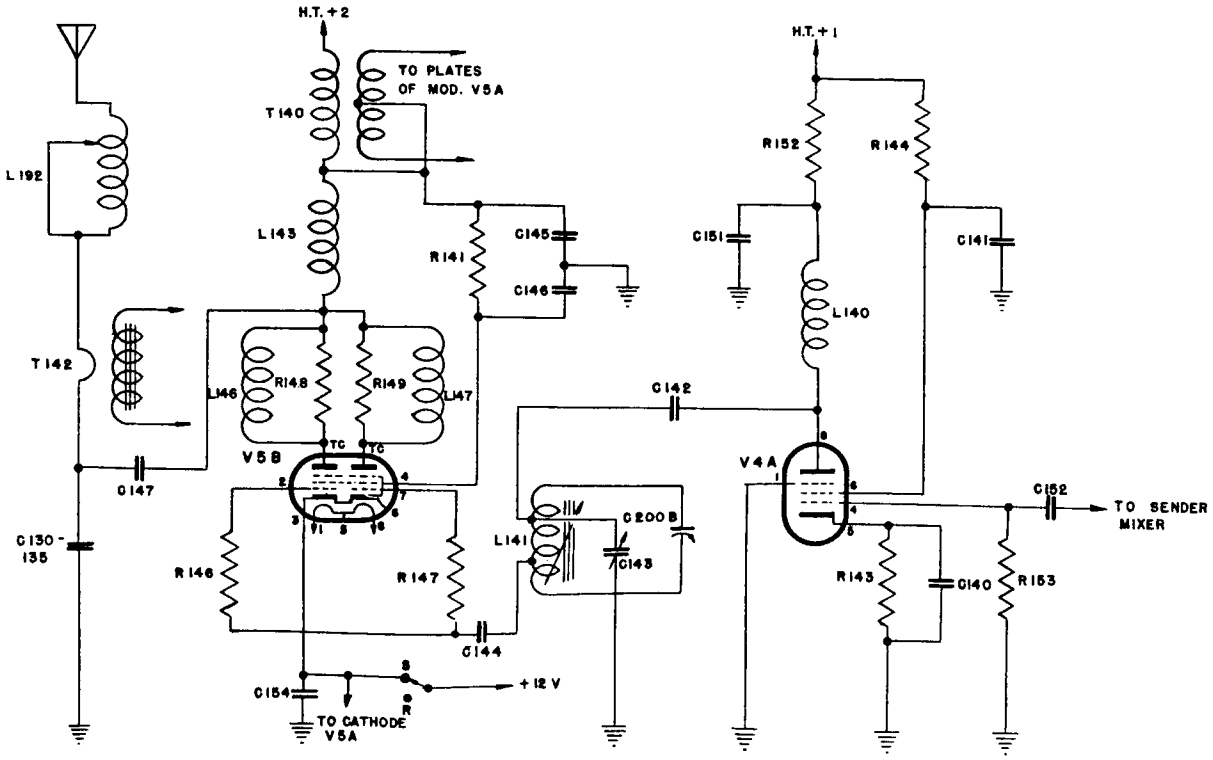
59. The I.P.A. output is taken from a second tap on L141 and applied via C144 to the grid circuit of the P.A. valve, V5B. This point is tapped well down on the coil to offset the capacity effect of the parallel V5B grids.

Power amplifier

60. The two sections of the dual, beam power valve, V5B (815), are operated in parallel. Resistors R146, R147, R148 and R149, in the grid and plate circuits, suppress parasitic oscillations. R148 and R149 are shunted by small V.H.F. chokes which are wound on each resistor. The parallel plates are shunt fed through the secondary of T140 and the R.F. choke, L143, from the H.T.2 supply. The plate R.F. circuit consists of an "L" type, tuned network comprising the high "Q" A.T.U. coil ("Q"—150) and fixed condensers selected by S100B.

61. H.T.2 is applied to the screen grids of V5B through the secondary of T140 and dropping resistor R141. Thus, the screens are also effectively modulated on R/T. When S140 is in the low power position, bleeder resistor R142 is connected from the screen grids to ground, reducing the screen voltage and, consequently, the R.F. output of the stage.

62. The R.F. excitation applied to the control grids is between 35 and 45 V. and rectified grid current through R145 provides bias. The grid D.C. path is through R.F. choke L142, R145, S0140 to the supply unit, and R226. The voltage drop across R226 may be measured by the test meter to give an indication of drive. When keying relay, S142, is energized, the cathode of V5B is connected to +12 V. providing cathode bias. When the keying relay circuit is opened, the cathode is connected through resistors R160 (R/T only) and R140 to the cathode of V5A which has a potential of +81 V. on it on receive, biasing both valves to cut-off.

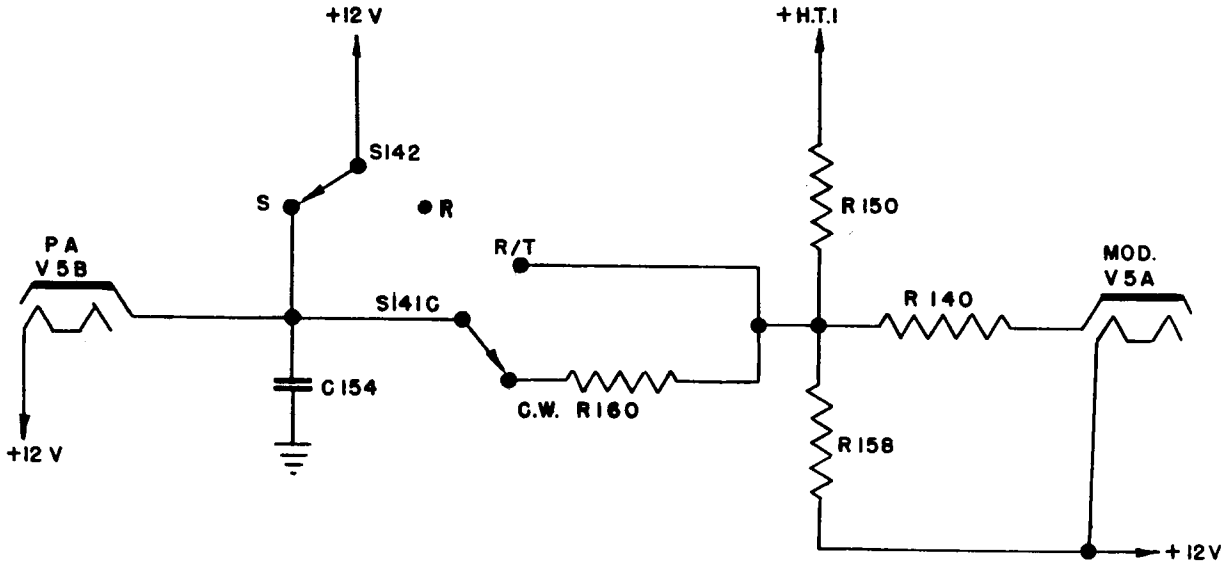


DME 85168

FIG. 8—INTERMEDIATE POWER AMPLIFIER AND POWER AMPLIFIER

Modulator

63. The two sections of the modulator valve, V5A (815), are operated Class B in push-pull. The output of the A.F. stages is applied to the grids by T141. T140 is the modulation transformer. H.T.2 is supplied to the V5A plates via the centre-tapped primary winding of T140. H.T.1 is supplied to the screen grids. On send R/T the cathode is returned to +12 V., L.T. through R140 and S142, and is biased at +15 V. for normal operation. On receive, the circuit through R140 is opened by S142, leaving the cathode connected to the junction of R150 and R158 which form a voltage divider between +150 V. and +12 V. This places the cathode at a potential of +81 V., and the valve is biased beyond cut-off. On send C.W., S141C switches R160 in the circuit. Since R158 is now shunted by R160 and R140, the cathode potential is reduced to +58 V. This, however, is still sufficient to bias the modulator valve beyond cut-off.



DME 85172 FIG. 9—MODULATOR AND P.A. BIAS CIRCUIT

Aerial current rectifier

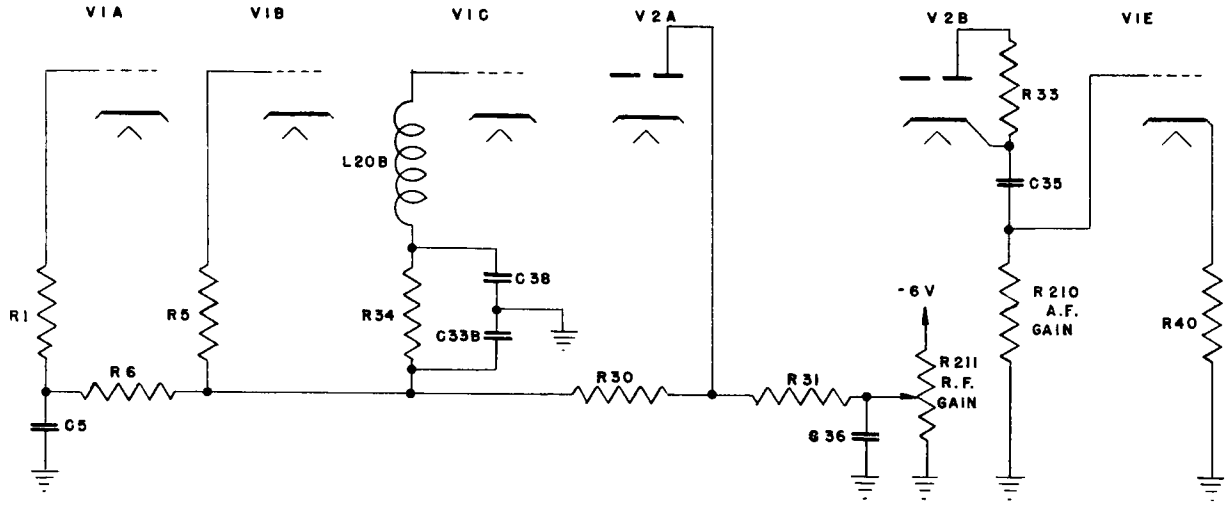
64. This circuit is used to provide an indication of aerial current on send. The tapped secondary winding of aerial transformer, T142, is wound around a ring-shaped, powdered-iron core, through which passes the single primary lead. The smaller portion of the tapped secondary winding is resonant at 6 Mc/s.; the larger, at 3 Mc/s. The voltage induced in the secondary winding is fed through damping resistors, R155 and R156, to the full-wave, dry rectifier, W140. C153 by-passes the meter circuit. The centre of the rectifier is connected to +12 V. and the secondary tap is connected through load resistors, R188 and R186, on the electronic control chassis, to +12 V. The junction of R188 and R186 is connected through S0140 to the supply unit where the voltage drop across R186 may be measured by the test meter.

Remote unit

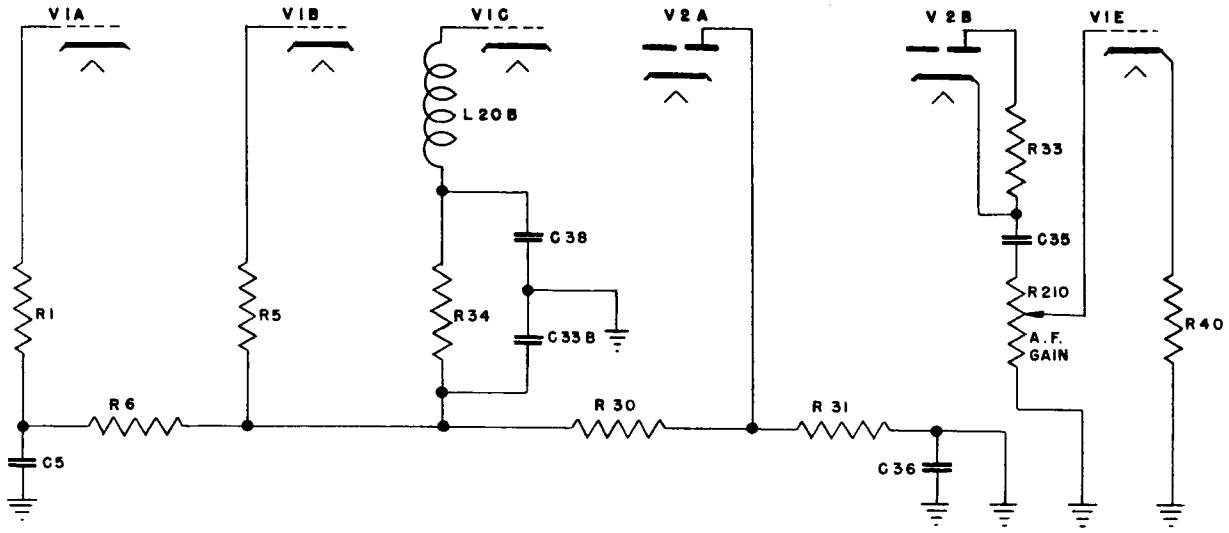
65. The remote unit, on which are mounted the three tuning pushbuttons and the gain control, may be plugged into the "A" set front panel directly or through a 10 ft. extension cable. The A.F. and R.F. gain controls, R210 and R211 respectively, are ganged on one shaft. The A.F. gain control functions only on R/T, and the R.F. gain control only on C.W.

66. On C.W., the A.F. gain circuit is opened, A.V.C. is removed and a negative bias is applied to the A.V.C.-controlled valves through the R.F. gain control. There is an A.V.C. delay bias of 8—15½ V. on V2A 8 V. of which is fixed cathode bias. A variable negative potential of 0—7½ V. is supplied to the A.V.C. diode plate through R211 and R31 from R225 in the negative ground return of DM220 secondary winding. For best C.W. operation, the R.F. gain control is set for the minimum negative potential that will prevent A.V.C. rectification at V2A.

67. The function of the various switches in the remote unit is explained in Paras. 88 and 89. It should be noted that S210, S211 and S212 work in conjunction with pushbuttons 1, 2 and 3 respectively, while S213 is actuated by pushing any pushbutton, a mechanical delay being incorporated so that it does not close until the pushbutton switch has closed.



DME 85170 FIG. 10—GAIN CONTROL CIRCUIT ON R/T.



DME 85171 FIG. 11—GAIN CONTROL CIRCUIT ON C.W.

Dial drive tuning motors

68. TM200 and TM50 are electric tuning motors operated simultaneously to drive the R.F. and oscillator tuning dials on automatic pushbutton operation of the "A" set. They are 12 V., 60 cycle A.C., split-phase type motors operating on the square-wave output of polarity changer, G220. Each motor has two stator windings, one winding of each being connected in series and fed directly from G220, the remaining windings being connected in parallel and fed through C155. The parallel windings draw the greater current so the load on the polarity changer is essentially capacitive. This type of motor does not draw increased current when stalled by the locking of the selector mechanism at the pre-set position.

Pre-selector mechanism

69. An extremely accurate pre-selector mechanism is used to return each of the two variable condensers to pre-determined positions. Fig. 16 shows a sectional view of a pre-selector mechanism. Three identical pre-set units, one for each pre-set channel, comprise one mechanism. The main drive pinion is coupled to the tuning motor windings, 12V., D.C. is simultaneously applied to the brake release coils, L200 and L62, which release the normally engaged friction brakes.

70. Each pre-set unit consists of a centre locking washer, 8 sleeve washers and two gears (X and Z). Each sleeve washer has a small dog on its circumference, bent over 90° in one direction. The centre locking sleeve washer has

a small vertical dog on its circumference. This washer can be locked to the main shaft by means of horizontal pressure applied by the locking sleeve when the locking knob is turned fully clockwise, this pressure being transmitted by two bushings on the main shaft. The sleeve washers rotate freely on the bushings. Four of the sleeve washers are located between the centre locking washer and the X gear; four between the centre locking washer and the Z gear. The gear train is such that the X and Z gears are driven in opposite directions. Both gears have a dog located on the side nearest the centre locking washer. When the X gear is driven, this dog engages the nearest sleeve washer dog, which in turn engages the dog on the next sleeve washer, etc., until the X gear is driving the centre locking washer. At the same time, and in a similar manner, the Z gear is driving its sleeve washers towards the centre locking washer from the opposite direction until both jam. Thus, pre-set returnability is unaffected by wear. This jamming, or locking will always occur at the same point for one pre-set unit, but, as the centre locking washer may be set to any desired angle radial to the main shaft, it may be pre-set to occur at any desired angle and cycle of main shaft rotation. The main shaft is, in turn, geared to the variable condenser shaft through anti-backlash gearing. Thus each pre-set unit may be set to return the condenser to its pre-determined position from either direction. Initial tension is placed on the system by adjustment of the nuts at the end of the main shaft. This tension is great enough that the main shaft may be rotated manually without disturbing the set-up, after the position of the centre locking washer has been set up with respect to the variable condenser. Thus the three positions may be set up consecutively without individual locking, as long as the specific solenoid for that unit is energized.

71. Each of the two pre-selector mechanisms is fitted with three small solenoids (L201-L202-L203 and L59-L60-L61 respectively) which operate in conjunction with the three push-buttons, one solenoid on each mechanism being actuated on pressing the corresponding push-button. Each solenoid operates a latch which engages an idler pinion in the pre-selector gear train so that the motor drives only the desired pre-set unit. The solenoid and brake release operate simultaneously.

Aerial tuning unit

72. The aerial tuning unit, L192, is a high "Q" coil connected in series between the set and the aerial and used to artificially load the aerial to a resonant, one-quarter wavelength. The coil may be rotated manually, or, when the "A" set is being operated automatically, by the electric tuning motor. A contact wheel is used to short-circuit the unused portion of the coil. The indicating dial, operated through Geneva gears, is numbered from 0 to 95 for logging purposes.

73. The tuning motor, TM190, is a reversible, series-wound, 12 V., D.C. motor. The motor armature rotates at a speed of approximately 7000 r.p.m. but reduction gearing in the motor assembly reduces the shaft speed to 140 r.p.m. The mechanical friction brake, normally held engaged by spring pressure, is released by the brake-release coil which is supplied with 12 V., D.C. simultaneously with the application of power to the motor. The brake is held in the released position as long as power is applied to the motor. When the power is switched off, the brakes are once again applied by spring pressure stopping the motor armature within 7 revolutions.

74. The reversal of the tuning motor is accomplished by a double field winding and one section of S190. Before voltage is applied the contacts of S190 are held open by spring pressure. Thus, when voltage is first applied, current always flows through the section of the field winding that operates the motor in such a direction as to rotate L192 towards the maximum inductance end. Since the control system, (See Para. 89) is not sensitised, L192 is free to rotate to maximum inductance at which time a stop on the Geneva gear strikes S190 reversing its contacts. Voltage is now applied to the other section of the field winding, reversing the motor and causing L192 to rotate towards the low inductance end. The control circuit now being sensitised, voltage is removed from the tuning motor by control relay, S180, on reaching a sender aerial current peak. This method of loading the aerial ensures that the circuit is not tuned to a harmonic of the sender frequency.

R/T-C.W. switch

75. When the R/T-C.W. switch, S141A-B-C, is at R/T position:—

(a) The H.T.2 dynamotor relay coil, L225, is connected to the microphone pressel circuit and to the control relay, S180, so the dynamotor relay may be actuated by grounding the relay coil at either point. This applies only when the set is switched to TRAFFIC.

(b) The A.V.C. load resistor, R31, is grounded.

(c) The moving arm of the A.F. GAIN control, R210, is connected through S50A on receive to the control grid of the 1st A.F. amplifier, V1E.

(d) R160 is shorted placing the proper cathode bias on the modulator, V5A, while on send. (See Para. 63).

76. When S141A-B-C is at C.W. position:—

(a) L225 is disconnected from the microphone pressel circuit and the control relay and connected to ground, thus actuating the relay and the dynamotor.

(b) The low potential end of the A.V.C. load resistor, R31, is connected to the moving arm of the R.F. GAIN control, R211.

(c) The key jack, J140, is connected to L145, the actuating coil of keying relay, S142. Closing the Morse key completes this circuit to ground operating the keying relay.

(d) + H.T.1 is applied to the B.F.O. through R154.

(e) The primary of microphone transformer, T40, is coupled to the plate of V1E by C40 via the keying relay, S142. This completes the feedback circuit changing V1E to an audio oscillator to provide C.W. sidetone.

(f) On receive the moving arm of the A.F. GAIN control is open circuited. The high potential side of the control is connected to the control grid of V1E through S50A, resulting in maximum A.F. signal voltage being applied to this grid.

(g) R160 is inserted in the cathode circuit of V5A biasing the modulator to cut-off on send.

Send-receive relay

77. L63 is the actuating coil for the 12 V., rotary type, send-receive relay, S50A-B. On receive, most of the turns of L63 are shorted, the tap being connected to the low potential side of the coil by S50A. When the relay circuit is completed by pressing the pressel switch or the key, the heavy current through the few remaining turns throws the relay from receive to send very rapidly. With S50A at send, the short on L63 is removed and the small current through the entire coil is sufficient to hold the relay. When the relay is on send, a 2000 uF. condenser, C156, in series with R157 is shunted across L63. R157 limits the surge current while the condenser is charging. C156 provides a delay of ¼ second or more to ensure that the relay remains on send at normal speeds of C.W. keying. However, should keying cease, the relay returns to receive, providing C.W. break-in operation. Immediately upon resumption of keying the keying relay again throws the send-receive relay to send.

78. On receive, S50A performs the following functions:—

(a) The tap on L63 is shorted to one end of the coil.

(b) + H.T.1 is applied to V1A, V1B, V1C and V1D via TB141.

(c) V1E grid is connected to the moving arm or high potential end of R210 via S141C, term. 6.

79. On receive, S50B:

(a) Connects the C.W. heterodyne control, C149, in series with C69, across the B.F.O. coil, L56.

(b) Grounds C74 (See Para. 52).

(c) Grounds the cathode of the sender mixer, V1J.

80. On send, S50A:—

(a) Removes the short circuit from L63.

(b) Removes + H.T.1 from V1A, V1B, V1C and V1D.

(c) Applies + H.T.1 to V1J, V4A and V3B.

(d) Disconnects V1E grid from R210 and connects it to the secondary winding of T40.

81. On send, S50B:—

(a) Disconnects C149 from the B.F.O. circuit and substitutes fixed condenser, C75.

(b) Disconnects C74 from ground and connects it to V3B grid, locking the B.F.O. in with the crystal oscillator.

(c) Disconnects V1J cathode from ground and connects it to the B.F.O. output lead from L57B.

Keying relay

82. L145 is the actuating coil of the 12 V., rotary type, keying relay, S142. To energize it, the circuit must be completed to ground by S180, the control relay, or through S141B, by the pressel switch. On receive the relay is not energized and the aerial circuit is connected to V1A grid. On send, the relay performs the following functions:—

(a) Disconnects the aerial circuit from V1A grid and connects it through L144 to the electronic control chassis.

(b) Completes the C.W. sidetone circuit (See Para. 42).

(c) Grounds L63, throwing the send-receive relay to send.

(d) Connects the cathode of V5B to + 12 V., thereby reducing the bias and allowing the valve to operate. This switching also renders the modulator operative on R/T (See Para. 63).

A.T.U. switch

83. S143 is a compression type switch and is closed by the front cover when it is placed over the present switches. On removing the front cover, this switch opens the + 12 V. circuit to TM190 preventing the A.T.U. from continuously "hunting" while setting up the pre-set positions. It also opens the connection from L180 to the residual circuit and to V2D so that the control relay will not continue to be energized when a pushbutton is released.

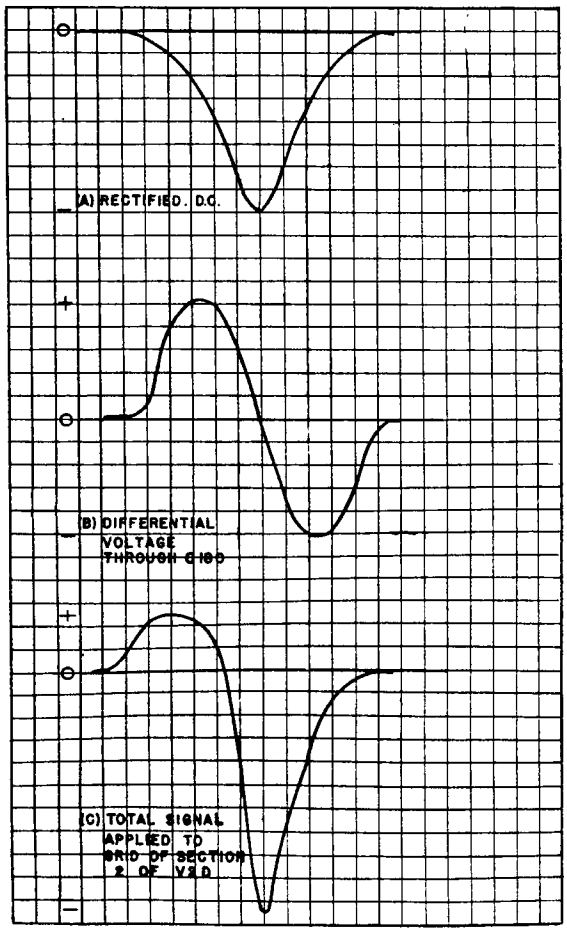
A.T.U. electronic control

84. When S143 is closed, L180, the actuating coil for S180, is connected between + H.T.1 and the plate of V2D, section 2. The plate current of Section 2 of V2D (5mA. approximately) is insufficient to energize L180 but is capable of holding the relay in the energized position if it is once thrown. A.T.U. control is accomplished by applying a signal to the grid of V2D, section 2, when the sender current reaches a peak, biasing the valve momentarily to cut-off, and thereby releasing S180 due to the reduction of holding current through L180. When S180 is released, the power is removed from the A.T.U. tuning motor, TM190, which is immediately stopped by the automatic brakes.

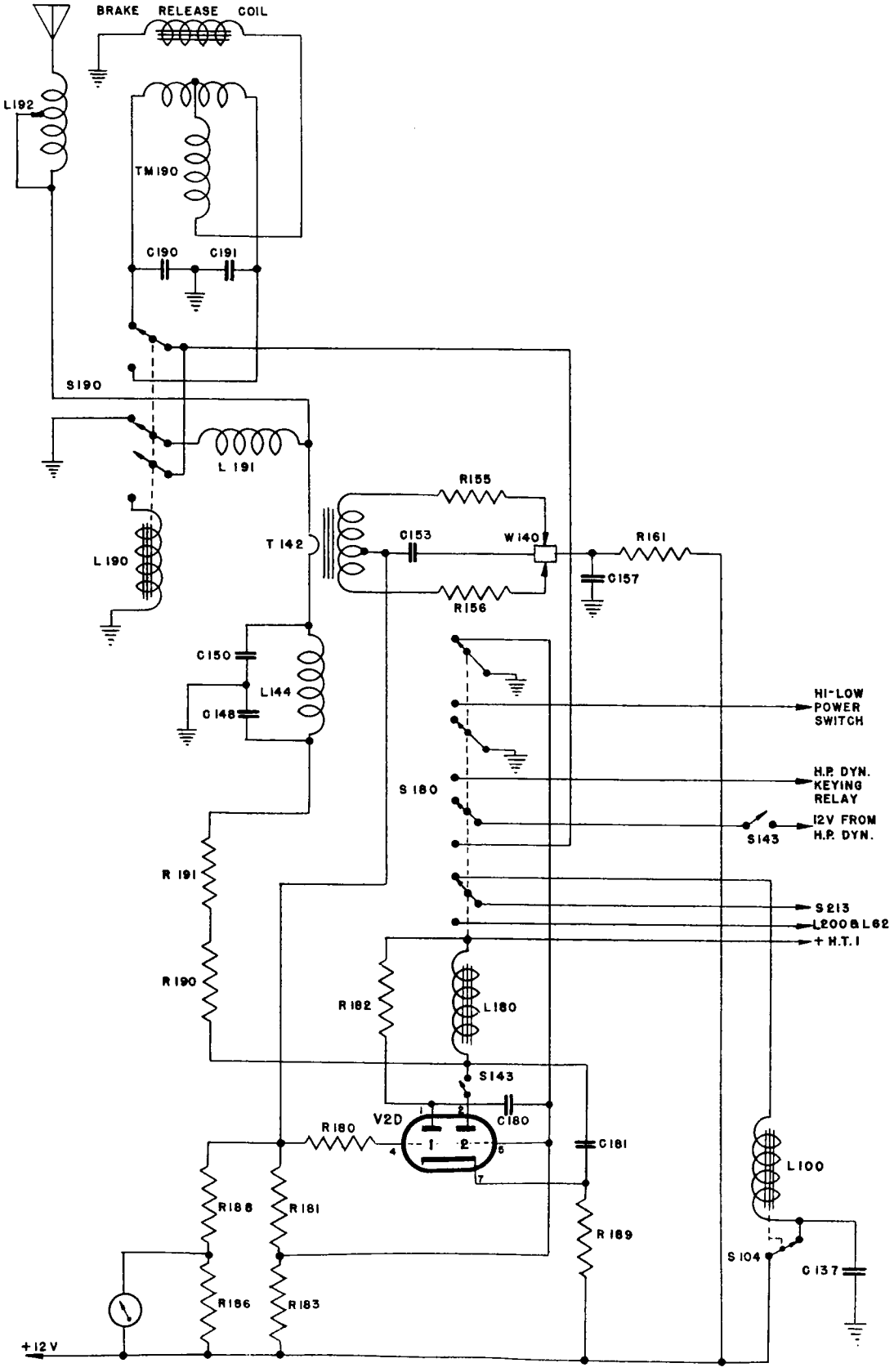
85. The meter transformer, T142, provides the required signal by supplying a negative D.C. potential which varies directly with the aerial current. Thus, when the antenna coil passes through resonance, a D.C. voltage is developed across R181 and R183 as shown in Fig. 12 (a) and is applied to the grid of V2D, section 1, through R180. This signal is amplified approximately 20 times in section 1 of V2D and is fed to the grid of section 2 through C180. As the voltage induced on one plate of a condenser varies as the rate of change of voltage on the other plate, the voltage appearing on the grid of section 2 of V2D through C180 is the differential of the resonance curve shown in Fig. 12 (a). The differential voltage curve as the antenna coil passes through resonance is shown in Fig. 12 (b). In addition half the D.C. resonance voltage from the meter transformer is fed to the grid of section 2 of V2D through R181. The relative amplitudes of these two voltages on the grid are shown in Fig. 12 (a) and (b) and the resulting voltage on the grid is the sum of these voltages as shown in Fig. 12 (c). This arrangement results in a sharp negative voltage, with sufficient amplitude to cut off the valve, being applied to the grid of section 2 of V2D at the instant the aerial reaches resonance.

86. The control relay, S180, is designed to release when the current through L180 is reduced to approximately 2.5 mA. Thus, the power to TM190 is removed slightly before section 2 of V2D is biased to cut-off, and, therefore slightly before the A.T.U. is tuned to resonance. This allows for slight coasting of TM190 before the brakes can completely stop it. This system is independent of the amplitude of the sender output.

87. To prevent peaking on a harmonic, it is required that this control system be rendered inoperative while the A.T.U. is tuning to maximum inductance. S190 accomplishes this by grounding the aerial lead through R.F. choke, L191. This completes the path from + H.T.1 through L180, S143, R190, R191, L144, S142, T142, L191 and S190 to ground, and causes a residual current of approximately 3.5 mA. to flow through L180 which is sufficient to hold the relay whether or not V2D, section 2, is cut-off. This ground connection is removed when the A.T.U. reverses S190.



DME 85177
FIG. 12—CUT-OFF VOLTAGE GRAPHS



DME 85176 FIG. 13—ELECTRONIC CONTROL CIRCUIT

Control sequence

88. Two circuits in the remote unit are completed by each pushbutton. The third circuit, S213, is common to all pushbuttons and is adjusted mechanically to close after circuits one and two are closed. No circuits are completed after the pushbutton is released.

89. If, for example, it is desired to tune the "A" set automatically to the No. 2 pushbutton pre-set frequency, the following sequence of events will occur:—

(a) When No. 2 pushbutton is pressed, S211 circuit contacts 1 and 2 are closed.

(b) No. 1 circuit contact connects the plate of V2D, section 2, to ground through S100A, S102 and S211, rendering the valve inoperative. (Note that all contacts on switches S101, S102, S103 and S100A are connected in parallel).

(c) No. 2 circuit contact grounds L60 and L202, energizing them. These solenoids engage the idler pinions in the channel 2 portion of the oscillator and R.F. dial tuning mechanisms (See Para. 69).

(d) S213 closes slightly after S211 and grounds the stepping relay, S104, through S180. The stepping relay turns all the S100 switches counterclockwise in 30° steps to the preselected position. At this point S100A rotor grounds L180 which, in turn, throws the control relay, S180.

(e) S180, when thrown, breaks the circuit between S104 and ground stopping the stepping relay in the preselected position; connects brake release coils, L62 and L200, to ground through S213, energizing them; and connects the polarity changer, G220, to ground through S0140, pin 26. The polarity changer supplies 12 V., 60 c/s., A.C. to the tuning motors which operate until the dogs lock in the dial tuning mechanism at the channel 2 preselected position.

(f) 12 V. is fed to TM190 through S143 and S180 and the A.T.U. coil is rotated.

(g) L145 is grounded through S180 and throws the keying relay to send. The keying relay, in turn, throws S50A-B to send. On TRAFFIC, L225 is grounded through S141 (on R/T) and S0140, operating the H.T. 2 dynamotor relay, S221.

(h) The ground connection is removed from the grid of V2D, section 2.

(i) R142 is grounded and is connected in parallel with S140 placing the set on low power automatically throughout the A.T.U. tuning cycle.

(j) Once the tuning motors have stopped the No. 2 pushbutton must be released or the A.T.U. will not stop at a peak due to the plate of V2D, section 2, being grounded.

(k) When No. 2 pushbutton is released, S213 opens first removing the power from the two dial tuning motors and applying the brakes.

(l) Circuit contacts 1 and 2 of S211 are opened. Contact No. 1 removes the ground connection to L180 and the plate of V2D, section 2, and S180 is held closed by the 5 mA. plate current. Contact 2 removes voltage from L60 and L202 disengaging the idler pinions from the channel 2 section of the dial tuning mechanisms.

(m) The A.T.U. will tune to an aerial current peak, and supply a negative pulse to cut off V2D, thereby releasing S180.

(n) When S180 is opened it disconnects S213 from G220 and the two motor brake coils, L62 and L200, and connects S213 again to stepping relay, S104. S180 also removes + 12 V. from TM190 and its series brake release coil. The ground connection to L45 is opened allowing the keying relay to return to receive. This, in turn, opens L63 circuit allowing S50A-B to return to receive. On R/T TRAFFIC, power is removed from the H.T. 2 dynamotor relay, L225. R142 ground connection is removed allowing S140 to function as a normal HIGH-LOW power switch. The grid of V2D, section 2, is grounded and since the cathode is at + 12 V., the valve is inoperative.

SUPPLY UNIT (Fig. 1004)

90. Supply Unit Cdn. Type 29 is used to power the "A" set. It may be operated from a two-wire L.T. source of either 12 or 24 V. The unit consists of:—

(a) An H.T.1 dynamotor, DM220, and filter providing an output of +150 V.

(b) An H.T.2 dynamotor, DM221, and filter providing an output of + 400 V.

(c) A polarity changer (vibrator), G220, providing A.C. for the two "A" set tuning motors.

(d) The STANDBY - OFF - TRAFFIC switch, the main power switch for the "A" set.

(e) The 12 V.-24 V. switch.

(f) The overvoltage relay,L226 and S223

(g) The H.T.2 send-receive relay, L225 and S221.

(h) The test meter and meter switch, M220 and S224.

(i) A socket on the rear apron, S0220, connected via the 22-point connector to S0140 at the rear of the "A" set.

(j) The 2-point input socket, S0221.

(k) A 12-point cannon socket, S0223, connected by a short 12-point connector to S0570 on the "B"-I.C. unit.

(l) A 12-point Pye plug, PL220, connecting to the control unit being used with the specific installation.

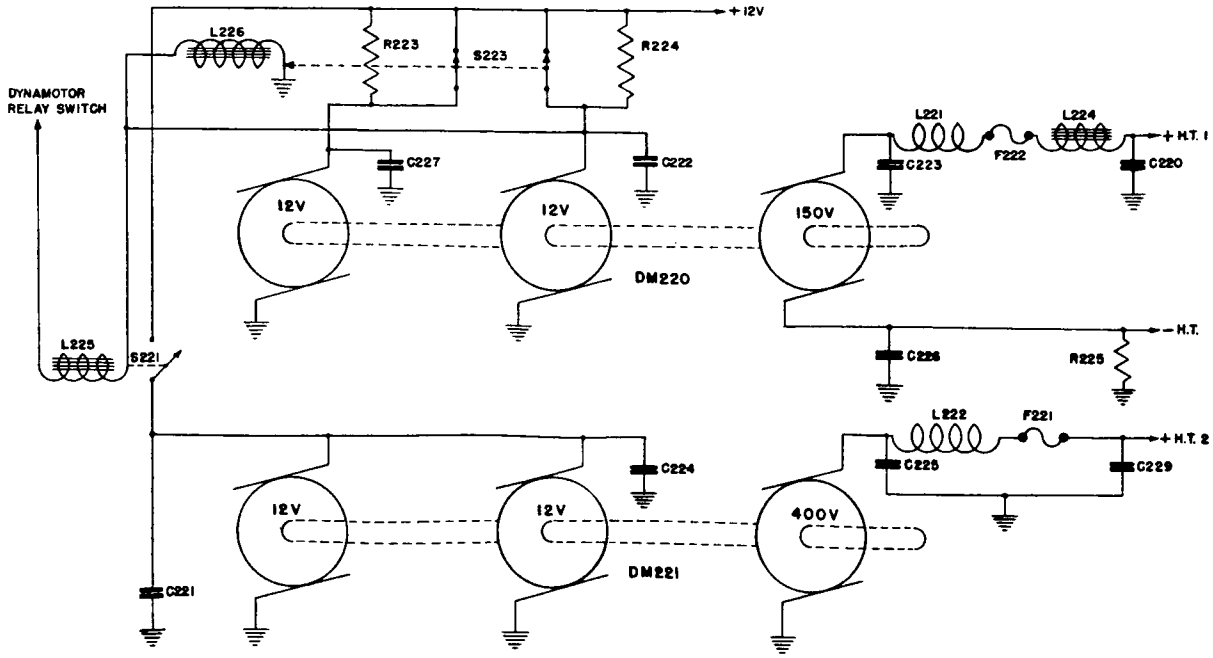
91. DM220 is a small, 3-commutator dynamotor. The armature has a 150 V. secondary winding and two 12 V. motor windings. Each motor winding operates in conjunction with one series and one shunt field. These motor windings, each in conjunction with its field windings, may be connected in series for 24 V. operation or in parallel for 12 V. operation. The 150 V. winding is returned to ground through R225 producing approximately $-7\frac{1}{2}$ V. bias, used in conjunction with the R.F. GAIN control when receiving C.W. signals.

92. DM221 is a large, 3-commutator dynamotor providing H.T. for SEND H.P. working. Except for its size and rating, it is identical with DM220.

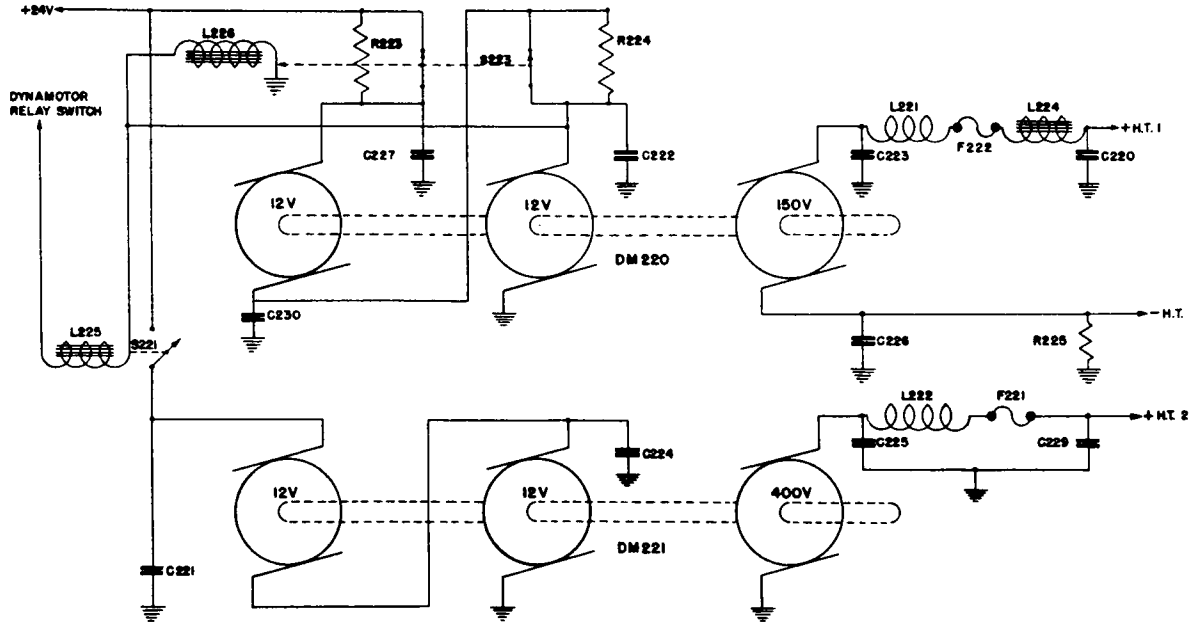
93. The "A" set valve heater circuit and all other "A" set L.T. circuits are an integral part of the supply unit circuit. These L.T. loads are balanced approximately and are connected in parallel with the 12 V. motor windings of the dynamotors. By thus utilizing the voltage drop across each 12 V. motor winding, 12 V. L.T. is always available regardless of whether a 12 or a 24 V. L.T. source is employed.

94. The heaters are arranged in four main 12 V. nets. L.T. is supplied to two of these nets whether on STANDBY or TRAFFIC. The two sender valve heater nets are supplied on TRAFFIC only. The valve heaters are protected against high voltage by over-voltage relay, S223, actuated by L226. The switches are normally closed, but when the voltage drop across one DM220 motor winding exceeds 14 V., the relay switches are opened, inserting R223 and R224 in series with the motor windings. These resistors each produce a 2 V. drop in potential. If the input voltage returns to a safe level, the relay opens, shorting out the series resistors. 24 V. pilot lamps are used throughout.

95. L225 is the actuating coil for the H.T. 2 dynamotor relay, S221. The return lead from this coil is taken to S141A where it is connected to the pressel circuit on R/T or is grounded on C.W.



DME 85187 FIG. 14—DYNAMOTORS ON 12 V. OPERATION



DME 85186 FIG. 15—DYNAMOTORS ON 24 V. OPERATION

"B" RECEIVER (Fig. 1005)

General

96. The "B" receiver employs a superheterodyne circuit operating on two fixed frequencies of 235 and 245 Mc/s. The conversion oscillator operates 70 Mc/s. higher in frequency than the incoming signal to provide a 70 Mc/s. I.F. channel. There is no actual I.F. stage, but amplification is secured through a superregenerative second detector which is separately quenched by a 48 Kc/s. quench oscillator.

R.F. amplifier

97. V1L (6AG5) and the associated circuit comprise the R.F. amplifier stage. The grid coil, L501, has a low "Q" and is permeability-tuned to resonate at 240 Mc/s. Being broadly resonant, it offers satisfactory response to both the 235 and 245 Mc/s. channels. Actual R.F. gain at these frequencies is slight, being approximately 1.5:1-2:1., however, this stage does effectively block re-radiation from the conversion oscillator and the superregenerative system. L502, the output coil in the plate circuit of V1L, has a high "Q" and is permeability-tuned to 240 Mc/s. At these frequencies this coil may be considered a pi net due to stray capacities to ground on each side. The resonant band width is approximately 8 Mc/s.

Mixer

98. Signal and oscillator voltages are both applied to the control grid of the mixer valve, V1M (6AG5), the oscillator voltages being induced in L502 from L508. The plate circuit is resistance-capacity coupled to the grid circuit of V6A.

Oscillator

99. The conversion oscillator, V2F (6J6), is a push-pull T.P.T.G. oscillator operating at a frequency 70 Mc/s. higher than that of the incoming signal. The grid coil, L508, is broadly resonant and the high "Q" lecher-bar plate tank circuit controls the frequency. To provide additional feedback for more powerful oscillation, the grid coil is loosely coupled to the plate tank circuit. H.T. is fed to the plate tank through a decoupling filter.

100. On Channel 5 a shorting bar is adjusted along the length of the lecher bars to tune the oscillator to exactly 315 Mc/s. On Channel 4, series condensers C522, C523 and C524 are shunted across the lecher bars. C522 is adjusted to tune the oscillator to exactly 305 Mc/s. The plates of the valves are tapped down on the lecher bars to raise the "Q" and to reduce the shunting effect of the valve interelectrode capacities. Cathode and heater chokes are essential at these frequencies to obtain oscillation.

Second detector

101. The superregenerative second detector, V6A (6C4), is a series fed Colpitts oscillator and is permeability tuned to 70 Mc/s. The outputs from the mixer valve, V1M, and the quench oscillator valve, V6B, are coupled to the grid of the second detector valve by C512 and C519 respectively. Resistors R512 and R519 serve as the grid resistor and the quench frequency is injected at the junction of these two resistors. A.F. voltages from this stage are developed across the plate load resistor, R513. C515 and R514 form the plate decoupling network and L505 is an R.F. choke.

102. The A.F. voltages developed across R513 are fed through the bridge filter to R516, the gain control. The bridge filter is of the band rejection type, broadly resonant to the quench frequency of 48 Kc/s. It may be considered as a high pass filter and a low pass filter connected in parallel.

Quench oscillator

103. V6B (6C4), the 48 Kc/s. quench oscillator used to produce superregeneration in V6A is a shunt fed, Hartley oscillator. The frequency is non-adjustable since the exact frequency is not critical. R515 is the plate load resistor; C509, the decoupling condenser.

A.F. circuit

104. The A.F. signal from the gain control is fed through the send-receive relay to the grid of V1N (6AG5), the 1st A.F. amplifier. The A.F. amplifier comprising V1N and V3D (6AK6) and associated components is identical with the I.C. amplifier (See Paras. 110 and 111) except for the send-receive switching and special output transformer. The output transformer, T550, has two secondary windings, only one of which is used on receive. The output from this transformer is terminated at pin 5 of S0570.

"B" SENDER (Fig. 1005)

Modulator

105. A.F. voltages from the microphone are applied via pin 2 of S0570 to the microphone transformer, T552, which is identical to that used in the I.C. amplifier. On send, V1N and V3D comprise the microphone amplifier, the control grid of V1N being connected to the secondary of T552 by the send-receive relay. The single secondary winding of T550 provides A.F. sidetone.

106. The push-pull, Class B modulator, V2H (6J6) if driven by the common A.F. stages through T550. Modulation transformer, T551, is used to plate modulate the sender oscillator, V2G.

Sender oscillator

107. V2G (6J6), the plate modulated sender oscillator, is coupled directly to the aerial. It is similar to the receiver conversion oscillator described in Paras. 99 and 100 except that the lecher bars are designed to operate at signal frequencies of 235 and 245 Mc/s. The aerial pick-up coil, L550 is coupled to the lecher bars.

Aerial circuit

108. The "B" set aerial is a vertical, centre-fed dipole having a total radiating length of one-half wavelength. The characteristic impedance is 72 ohms. The dipole is fed by a standard W/S No. 19 "B" set coaxial feeder having an impedance of approximately 75 ohms so the mismatch is slight. On send, the feeder is coupled to the sender output by the pick-up loop, L550, and, on receive, it is connected to a tap on L501, the tuned R.F. grid coil.

Send-receive switching

109. On switching from receive to send, the following circuit changes take place:—

(a) + H.T. is removed from V1L, V1M, V6A, V6B, but not from V2F.

(b) The moving arm of the B GAIN control is removed from its original circuit and is grounded.

(c) The grid of V1N is removed from its original circuit and connected to the microphone transformer, T552.

(d) The cathode resistor of V2H, open-circuited on receive, is grounded.

(e) + H.T. is applied through T551 primary to V2H, and through T515 secondary and the decoupling filter to the plates of V2G.

(f) The circuit between L501 and the aerial feeder is opened by the aerial relay.

I.C. AMPLIFIER (Fig. 1006)

110. Microphone transformer T571 has a 1:50 step-up ratio. A.F. voltages from the microphone circuit are fed to the primary of T571 via pin 3, S0570. A microphone return lead from the other end of the primary connects to pin 11 of S0570. The purpose of this lead is to reduce cross-talk and it is grounded in the control unit. When using a normal No. 19 set installation kit, however, this lead must be grounded in the set by a special link in the "A" supply unit. The primary of T571 is shunted by R577 which prevents open circuit hum or oscillation. Its loading action also

minimizes the effect of more than one microphone in the circuit at one time.

111. The I.C. amplifier is a conventional, resistance-capacity coupled amplifier. Cathode bias is employed in both stages, the unbypassed cathode resistors providing degeneration. In addition, R572 provides negative feedback. T570 is the output transformer and R570 across the secondary serves as a fixed load. The A.F. output (approximately 500 mW) is fed to pin 6 of S0570. T570 is designed to deliver optimum power output and matching when the secondary is shunted by five or six pairs of 100 ohm headphones. If only one or two pairs are used, the mismatch reduces the power output so the actual A.F. level appears unchanged. 100 to 200 mW of power is available when using one pair of headphones.

VIBRATOR POWER SUPPLY (Fig. 1007)

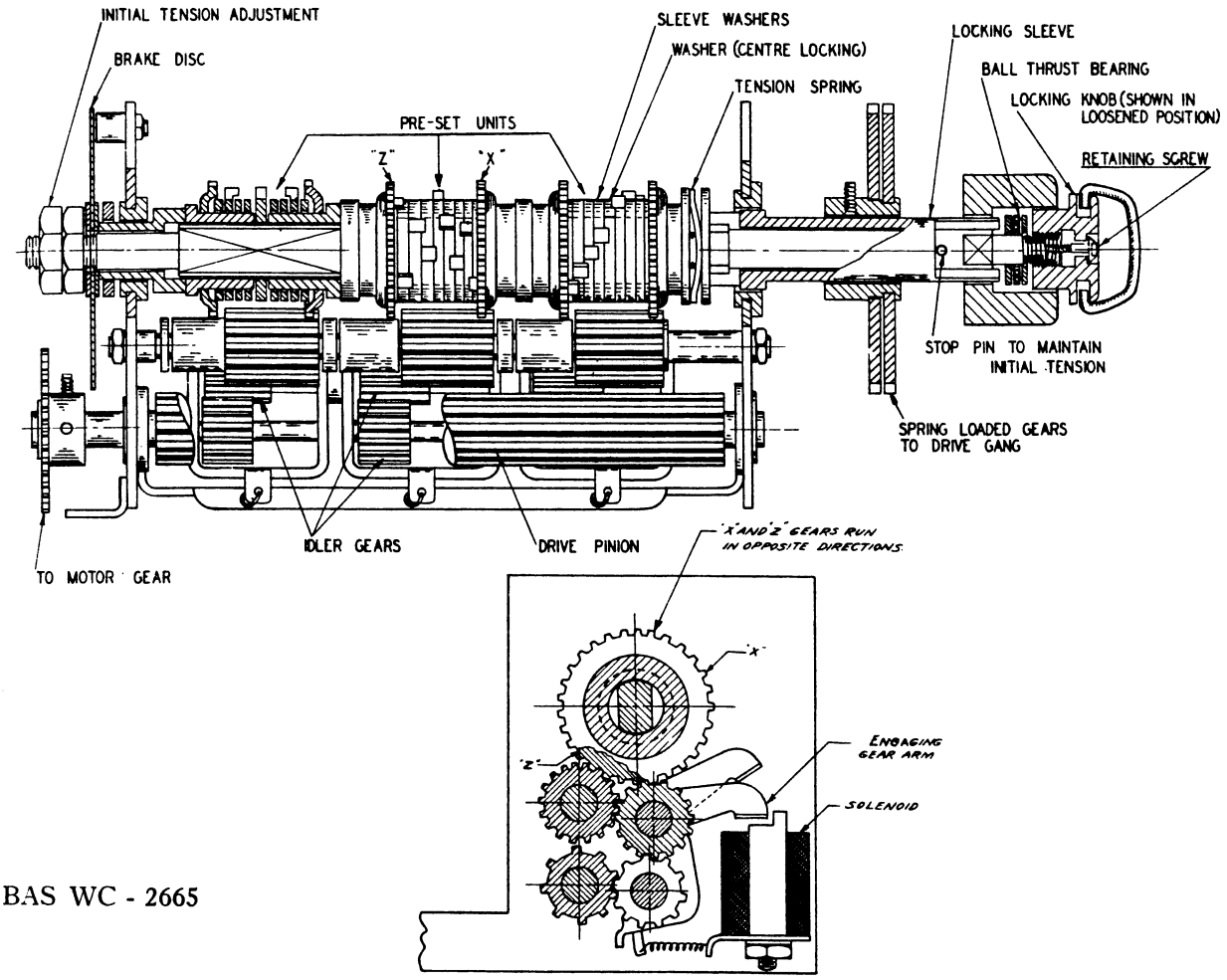
112. All connections to S0570 are made through a 12-point connector via the "A" supply unit. Pins 1 and 4 of S0570 are at ground potential; pins 7 and 10 are connected to either + 12 V. or + 24 V. F570 is in series with the + L.T. line to the "B" and I.C. ON-OFF switches, L.T. section, S571, S572, L573 and L572 with the associated condensers form an input filter in the L.T. line to the centre-tapped primary winding of vibrator transformer, T572. The vibrator actuating coil, connected between terminals 3 and 6 of the vibrator, V570, is connected to + L.T. through parallel resistors R581 and R582 on 24 V. operation. On 12 V. operation these resistors are shorted out. T572 has a compound primary circuit to provide for 12-24 V. switching. On 24 V. operation the three primary windings are connected in series with L571A. On 12 V. operation, the centre-tapped primary winding is connected in parallel with the remaining two primary windings which are connected in series to form another centre-tapped primary. All 12-24 V. switching in the vibrator circuit is performed by rotary wafer switch, S570. Pins 1 and 5 of G570 alternately ground the extremities of the primary circuit (s), at pin 6 via the vibrating contacts.

113. G570 is a synchronous vibrator, rectification in the secondary circuit of T572 taking place within the vibrator via terminals 2 and 4. + 150 V, is taken from the secondary centre-tap. R570 and C574 form an H.F. hash filter while L570 and C573A-B constitute a ripple filter. C575 and R580 across the secondary of T572 form a spark-suppression circuit.

Filament circuits

114. On 24 V. operation, + L.T. is fed through R584 to the actuating coils of the send-receive relay, L578, and the aerial relay, L576. These relay circuits are completed to ground by the microphone pressel switch. R584 is removed from the circuit on 12 V. operation

115. The heaters of the "B" set and I.C. amplifier valves are connected in a series-parallel network. The overvoltage relay coil, L577, is shunted across one-half the heater net so that it will have 12 V. impressed across it on either 12 or 24 V. operation. To provide overvoltage protection, this relay operates when its terminal potential reaches 14 V., opening S573 and thus placing R587 in series with the L.T. supply.



BAS WC - 2665

FIG 16 — PRESELECTOR MECHANISM

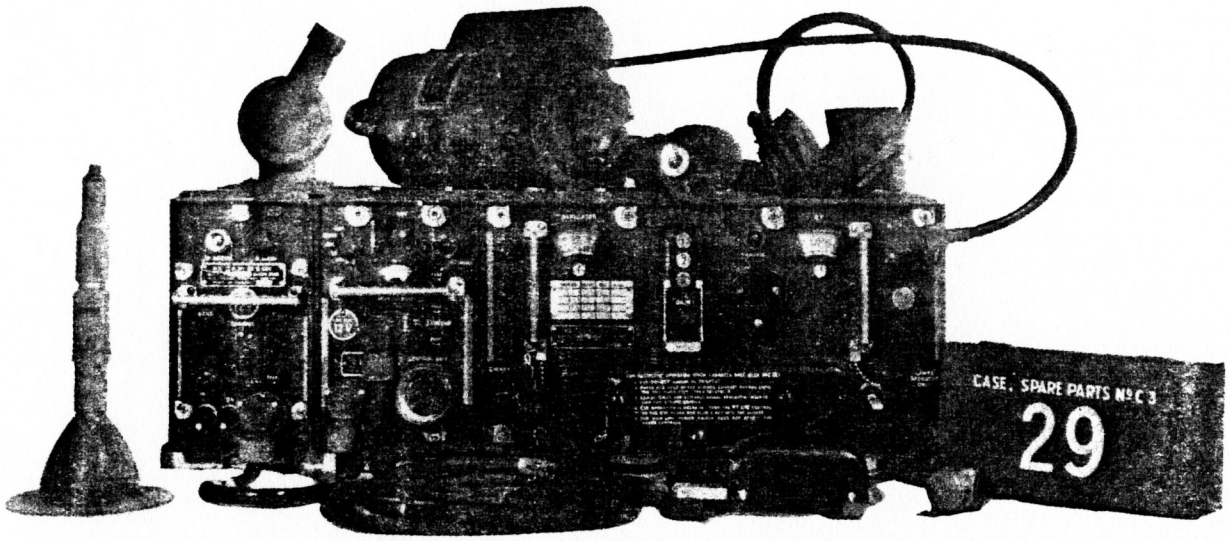


FIG. 1001—WIRELESS SET CDN. NO. 29 (COMPLETE SET)

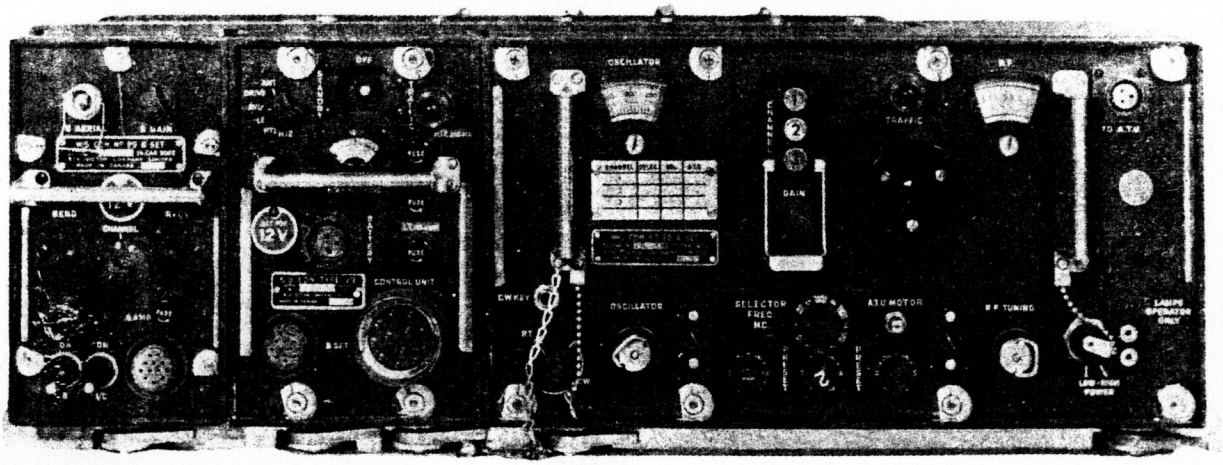


FIG. 1002—FRONT PANEL OF WIRELESS SET CDN. NO. 29

TABLE 1001—LIST OF COMPONENTS (FIG. 1003)

Circuit Ref.	Function or Value
CONDENSERS	
C1	100 uuF., 500 V.
C2	91 uuF., 500 V.
C3	3—13 uuF., 500 V.
C4	.01 uF., 400 V.
C5	.01 uF., 400 V.
C6	.01 uF., 400 V.
C7	7—45 uuF., 500 V.
C8	100 uuF., 500 V.
C9	.01 uF., 400 V.
C10	.01 uF., 400 V.
C11	270 uuF., 500 V.
C12	270 uuF., 500 V.
C13	8200 uuF., 300 V.
C14	1000 uuF., 500 V.
C20	270 uuF., 500 V.
C21	270 uuF., 500 V.
C22	.01 uF., 400 V.
C23	.01 uF., 400 V.
C24	270 uuF., 500 V.
C25	270 uuF., 500 V.
C26	.01 uF., 400 V.
C27	.01 uF., 400 V.
C28	.01 uF., 400 V.
C29	270 uuF., 500 V.
C30	270 uuF., 500 V.
C31	220 uuF., 500 V.
C32	100 uuF., 500 V.
C33A-B-C	.1 uF., 400 V.
C34	1. uuF., 500 V.
C35	.003 uF., 800 V.
C36	.01 uF., 400 V.
C37	8200 uuF., 300 V.
C38	.01 uF., 400 V.
C40	.01 uF., 400 V.
C41	180 uuF., 500 V.
C42	.01 uF., 400 V.
C43	.003 uF., 800 V.
C50	39 uuF., 500 V.
C51	.01 uF., 400 V.
C52	39 uuF., 500 V.
C53	.01 uF., 400 V.
C54	8200 uuF., 300 V.
C55	10 uuF., 500 V.
C56	4.5—75 uuF.
C57	15—281 uuF.
C58	39 uuF., 500 V.
C59	.01 uF., 400 V.
C60	.01 uF., 400 V.
C61	.01 uF., 400 V.
C62	110 uuF., 500 V.
C63	240 uuF., 500 V.
C64	240 uuF., 500 V.
C65	110 uuF., 500 V.
C66	.01 uF., 400 V.
C67	200 uuF., 500 V.
C68	47 uuF., 500 V.
C69	20 uuF., 500 V.
C70	270 uuF., 500 V.
C71	270 uuF., 500 V.
C72	8200 uuF., 300 V.
C73	8200 uuF., 300 V.
C74	5 uuF., 500 V.
C75	10 uuF., 500 V.
C76	8200 uuF., 300 V.
C80	.01 uF., 400 V.
C81	620 uuF., 500 V.
C82	3—13 uuF., 500 V.
C83	10 uuF., 500 V.
C84	.01 uF., 400 V.
C85	.01 uF., 400 V.
C86	390 uuF., 500 V.
C87	39 uuF., 500 V.
C88	620 uuF., 500 V.
C89	4—30 uuF., 500 V.
C90	5 uuF., 500 V.
C91	.01 uF., 400 V.
C92	4—30 uuF., 500 V.
C93	5 uuF., 500 V.
C94	.01 uF., 400 V.
C95	20 uuF., 500 V.
C100	750 uuF., 500 V.
C101	7—45 uuF., 500 V.
C102	330 uuF., 500 V.
C103	7—45 uuf., 500 V.
C104	180 uuF., 500 V.
C105	4—30 uuF., 500 V.
C106	100 uuF., 500 V.
C107	4—30 uuF., 500 V.
C108	56 uuF., 500 V.
C109	4—30 uuF., 500 V.
C110	22 uuF., 500 V.
C111	4—30 uuF., 500 V.
C112	4—30 uuF., 500 V.
C113	27 uuF., 500 V.
C114	750 uuF., 500 V.
C115	330 uuF., 500 V.
C116	7—45 uuF., 500 V.
C117	180 uuF., 500 V.
C118	7—45 uuF., 500 V.
C119	100 uuF., 500 V.
C120	4—30 uuF., 500 V.
C121	56 uuF., 500 V.
C122	4—30 uuF., 500 V.
C123	22 uuF., 500 V.
C124	4—30 uuF., 500 V.
C125	4—30 uuF., 500 V.
C126	4—30 uuF., 500 V.
C127	47 uuF., 500 V.
C128	7—45 uuF., 500 V.
C129	68 uuF., 500 V.
C130	270 uuF., 2500 V.
C131	220 uuF., 2500 V.
C132	150 uuF., 2500 V.
C133	100 uuF., 2500 V.
C134	68 uuF., 2500 V.
C135	47 uuF., 2500 V.
C136	8200 uuF., 300 V.
C137	2 uF., 50 V.
C140	.01 uF., 400 V.
C141	.01 uF., 400 V.
C142	390 uuF., 500 V.
C143	3—13 uuF., 500 V.
C144	390 uuF., 500 V.
C145	2200 uuF., 1200 V.
C146	1000 uuF., 2500 V.
C147	.01 uF., 1200 V.
C148	.01 uF., 400 V.
C149	3—25 uuF.
C150	10 uuF., 8000 V.
C151	.01 uF., 400 V.
C152	390 uuF., 500 V.
C153	1000 uuF., 500 V.
C154	.01 uF., 400 V.
C155	500 uF., 15 V.
C156	2000 uF., 16 V.
†C157	.01 uF., 400 V.
C180A	.01 uF., 400 V.
C181	.01 uF., 400 V.
C190	.01 uF., 400 V.
C191	.01 uF., 400 V.
C200A-B-C-D-E	15—545 uuF.
RESISTORS	
R1	470,000 ohms, ¼ W.
R2	1,000 ohms, ¼ W.
R3	27,000 ohms, ¼ W.
R4	120,000 ohms, ¼ W.
R5	1 megohms, ¼ W.
R6	470,000 ohms, ¼ W.
R7	10,000 ohms, ¼ W.
R8	100 ohms, ¼ W.
R20	220,000 ohms, ¼ W.
R21	1,000 ohms, ¼ W.
R22	27 ohms, ¼ W.
R23	470 ohms, ¼ W.
R24	68,000 ohms, ¼ W.
R25	1,000 ohms, ¼ W.
R26	220,000 ohms, ¼ W.
R27	220,000 ohms, ¼ W.
R28	3,900 ohms, ¼ W.
R29	6,800 ohms, ¼ W.
R30	470,000 ohms, ¼ W.
R31	470,000 ohms, ¼ W.
R32	560,000 ohms, ¼ W.
R33	560,000 ohms, ¼ W.
R34	100,000 ohms, ¼ W.
R35	100 ohms, ¼ W.
R40	3,900 ohms, ¼ W.
R41	2.2 megohms, ¼ W.
R42	470,000 ohms, ¼ W.
R43	470 ohms, ¼ W.
R44	1 megohms, ¼ W.
R45	470 ohms, ¼ W.
R50	100,000 ohms, ¼ W.
R51	470,000 ohms, ¼ W.
R52	47,000 ohms, ¼ W.
R53	8,200 ohms, ¼ W.
R54	47,000 ohms, ¼ W.
R55	68,000 ohms, ¼ W.
R56	1,000 ohms, ¼ W.
R57	12,000 ohms, ¼ W.
R58	47,000 ohms, ¼ W.
R59	1,000 ohms, ¼ W.
R60	330 ohms, ¼ W.
R61	2.2 megohms, ¼ W.
R62	2.2 megohms, ¼ W.
R63	68,000 ohms, ¼ W.
R64	68,000 ohms, ¼ W.
R65	20,000 ohms, ¼ W.
R66	47,000 ohms, ¼ W.
R67	12,000 ohms, ¼ W.
R68	12,000 ohms, ¼ W.
R69	47,000 ohms, ¼ W.
R70	47,000 ohms, ¼ W.
*R71	68 ohms, ¼ W.
R80	27,000 ohms, ½ W.
R81	470,000 ohms, ¼ W.
R82	470,000 ohms, ¼ W.
R83	68,000 ohms, ¼ W.
R84	1,000 ohms, ¼ W.
R85	470,000 ohms, ¼ W.
R86	10,000 ohms, ½ W.
R87	22,000 ohms, ¼ W.
R140	18 ohms, 1 W.
R141	12,000 ohms, 15 W.
R142	3,000 ohms, 10 W.
R143	82 ohms, ¼ W.
R144	8,200 ohms, ½ W.
R145	12,000 ohms, ¼ W.
R146	27 ohms, ¼ W.
R147	27 ohms, ¼ W.
R148	82 ohms, ¼ W.
R149	82 ohms, ¼ W.
R150	270,000 ohms, ¼ W.
R151	18 ohms, 1 W.
R152	1,000 ohms, ½ W.
R153	470,000 ohms, ¼ W.
‡R154	22,000 ohms, ¼ W.
R155	100 ohms, ½ W.
R156	27 ohms, ¼ W.
R157	10 ohms, ¼ W.
R158	270,000 ohm ¼ W.
R159	27,000 ohms, ¼ W.
R160	270,000 ohms, ¼ W.
†R161	470 ohms, ¼ W.
R180	1 megohm, ¼ W.
R181	1 megohm, ¼ W.
R182	47,000 ohms, ½ W.
R183	1 megohm, ¼ W.
R184	30 ohms, 5 W.
R186	2,200 ohms, ¼ W.
R188	10,000 ohms, ¼ W.
R189	47 ohms, ½ W.
R190	10,000 ohms, ½ W.
R191	22,000 ohms, 1 W.
R210	500,000 ohms var.
R211	10,000 ohms var.
INDUCTANCES	
L1A-B	R.F. transformer
L2	I.F. wave trap
L3A-B	1st I.F. transformer
L20A-B	2nd I.F. transformer
L21A-B	3rd I.F. transformer
L22A-B	4th I.F. transformer
L50	Crystal oscillator plate coil
L51A-B	Harmonic generator output transformer
L52	Var. osc. tank coil
L53	Low pass filter
L54	Low pass filter
L55	Low pass filter
L56	B.F.O. coil
L57A-B	B.F.O. output transformer.
L59	Pushbutton solenoid
L60	Pushbutton solenoid
L61	Pushbutton solenoid
L62	Brake solenoid
L63	Send-receive actuating coil
L64A-B	Bi-filar coupling coil
L80A-B	R.F. transformer
L81	R.F. choke
L82	V1H tank coil
L83A-B	R.F. transformer
L100	Stepping relay actuating coil
L140	R.F. choke
L141	V4A tank coil
L142	R.F. choke
L143	R.F. choke
L144	R.F. choke
L145	Keying relay actuating coil
L146	Parasitic choke
L147	Parasitic choke
L180	Control relay actuating coil
L190	A.T.U. relay coil
L191	R.F. choke
L192	A.T.U. coil
L200	Magnetic brake release coil
L201	Selector solenoid No. 1
L202	Selector solenoid No. 2
L203	Selector solenoid No. 3
TRANSFORMERS	
T40	Microphone input
T140	Modulation
T141	Receiver output and mod. driver
T142	Aerial current
SWITCHES	
S50A-B	Send-receive
S100A-B-C-D	Main selector gang
S101	No. 1 channel preset
S102	No. 2 channel preset
S103	No. 3 channel preset
S104	Stepping relay
S140	High-low power
S141A-B-C	R/T—C.W.
S142	Keying relay
S143	A.T.U.
S180	Control relay
S190	Motor reversing relay
S210	No. 1 pushbutton
S211	No. 2 pushbutton
S212	No. 3 pushbutton
S213	Common pushbutton
SOCKETS	
S0140	Supply unit connector
S0141	Aerial connector
S0142	Operator's lamp
S0190	Aerial connector A.T.U.
MISCELLANEOUS	
J140	Key jack
P140	Pilot lamp, Traffic
W140	Ae. current rectifier
TM50	Osc. tuning motor
TM190	Ae. tuning motor
TM200	R.F. tuning motor

*Sets below Serial No. 201, R71 was 470 ohms.
‡Omitted after Serial No. 200.
†Added after Serial No. 100.

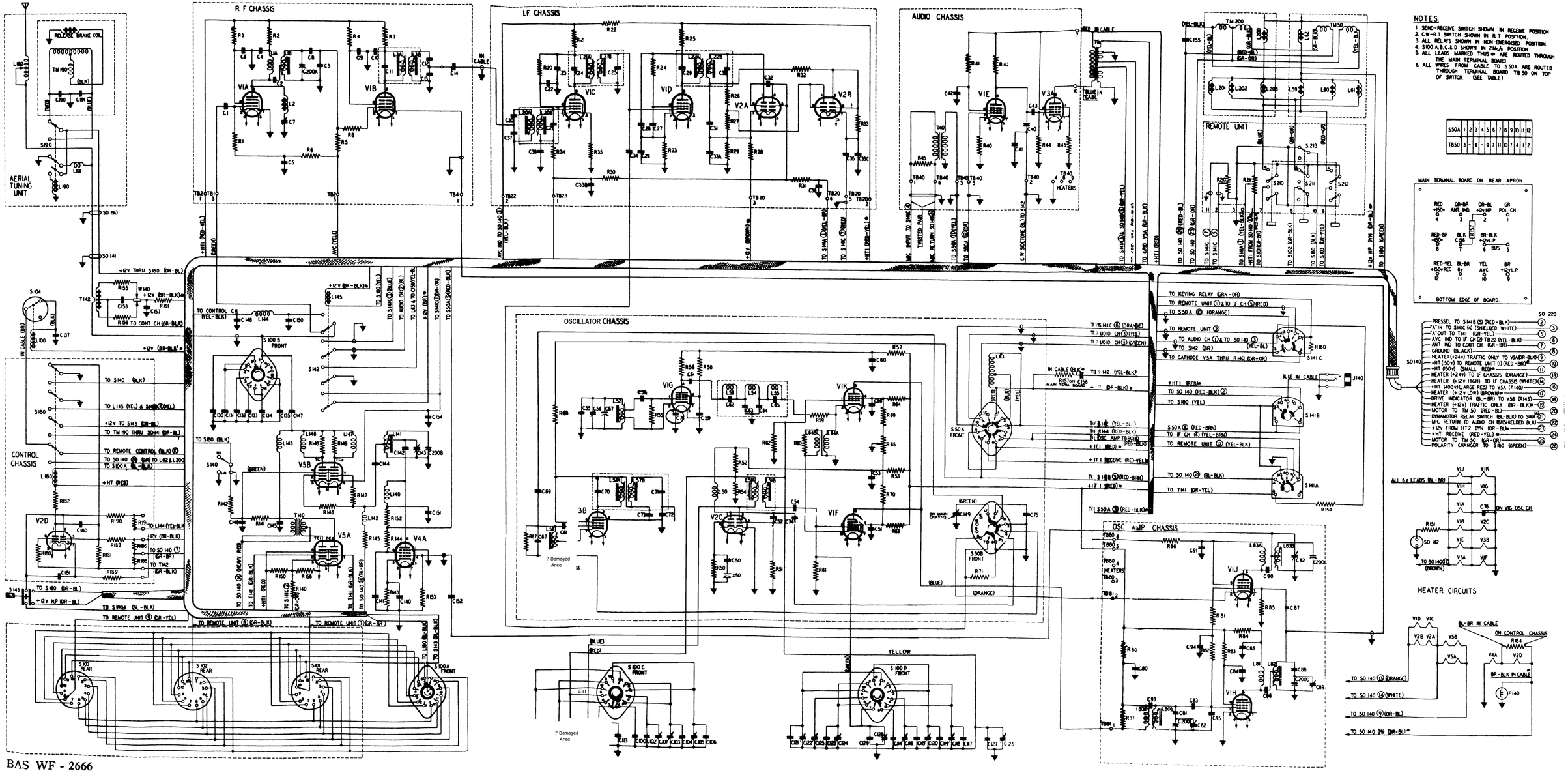


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FIG. 1003—SCHEMATIC DIAGRAM OF "A" SET WIRELESS SET CDN. NO. 29

TABLE 1002—LIST OF COMPONENTS (FIG. 1004)

Circuit Ref.	Function or Value
CONDENSERS	
C220	2 uF., 400 V.
C221	.01 uF., 400 V.
C222	.1 uF., 200 V.
C223	.01 uF., 400 V.
C224	.01 uF., 400 V.
C225	.01 uF., 1000 V.
C226	.01 uF., 400 V.
C227	.1 uF., 200 V.
C229	2 uF., 600 V.
C230	.01 uF., 400 V.
RESISTORS	
R220	1.6 megohms, 1 W.
R221	510,000 ohms, ½ W.
R222	47,000 ohms, ½ W.
R223	½ ohm, 10 W.
R224	½ ohm, 10 W.
R225	150 ohms, 1 W.
*R226	47 ohms, ½ W.
INDUCTANCES	
L220	A.F. choke
L221	R.F. choke
L222	R.F. choke
L224	A.F. filter choke
L225	H.T.2 dynamotor relay coil
L226	Over-voltage relay coil
SWITCHES	
S220	STANDBY - OFF - TRAFFIC
S221	H.T.2 dynamotor relay
S222	12 V.-24 V.
S223	Over-voltage relay
S224	Meter
SOCKETS	
S0220	"A" chassis connector
S0221	L.T. input
S0223	"B"-I.C. chassis connector
FUSES	
F220	15A., L.T.
F221	0.25 A., H.T.2
F222	0.125 A., H.T.1
F223	5 A., + 12 V.
MISCELLANEOUS	
G220	Polarity changer
M220	0-500 uA. meter
P220	Pilot lamp
DM220	Rotary transformer 15 W.
DM221	Rotary transformer 70 W.
PL220	Control unit connector

*Sets below Serial No. 210 used 68 ohm, ¼ W. and 150 ohm, ¼ W. resistors in parallel.

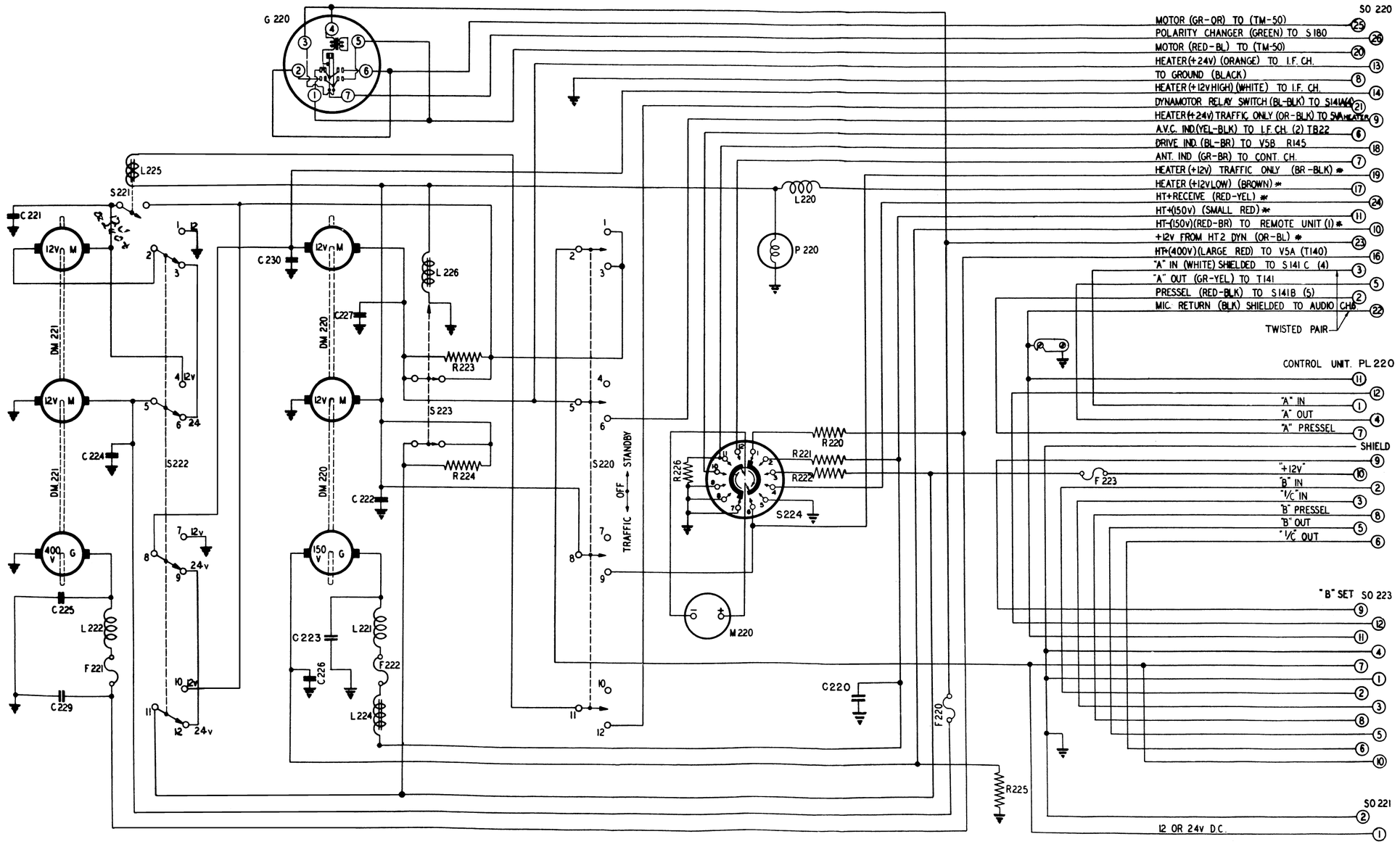


FIG. 1004—SCHEMATIC DIAGRAM OF SUPPLY UNIT CDN. TYPE 29

TABLE 1003—LIST OF COMPONENTS (FIG. 1005)

Circuit Ref.	Function or Value
CONDENSERS	
C500	100 uuF., 500 V.
C501	100 uuF., 500 V.
C502	100 uuF., 500 V.
C503	5 uuF., 500 V.
C504	470 uuF., 500 V.
C505	470 uuF., 500 V.
C506	470 uuF., 500 V.
C507	15 uuF., 500 V.
C508	470 uuF., 500 V.
C509	.01 uF., 400 V.
C510	.0033 uF., 500 V.
C511	470 uuF., 500 V.
C512	15 uuF., 500 V.
C513	5 uuF., 500 V.
C514	47 uuF., 500 V.
C515	.1 uF., 400 V.
C517	.001 uuF., 500 V.
C518	.003 uuF., 800 V.
C519	470 uuF., 500 V.
C520	470 uuF., 500 V.
C521	470 uuF., 500 V.
C522	3—13 uuF., 500 V.
C523	5 uuF., 500 V.
C524	10 uuF., 500 V.
C525	47 uuF., 500 V.
C550	470 uuF., 500 V.
C551	470 uuF., 500 V.
C552	5 uuF., 500 V.
C553	.003 uF., 800 V.
C554	.003 uF., 800 V.
C555	.001 uF., 500 V.
C556	.01 uF., 400 V.
C557	3—13 uuF., 500 V.
C558	10 uuF., 500 V.
RESISTORS	
R500	100 ohms, ½ W.
R501	100,000 ohms, ¼ W.
R502	220 ohms, ¼ W.
R503	68,000 ohms, ¼ W.
R504	2,200 ohms, ¼ W.
R505	100,000 ohms, ¼ W.
R506	1,200 ohms, ¼ W.
R507	220 ohms, ¼ W.
R508	68,000 ohms, ¼ W.
R509	10,000 ohms, ¼ W.
R510	68,000 ohms, ¼ W.
R511	8,200 ohms, ¼ W.
R512	100,000 ohms, ¼ W.
R513	100,000 ohms, ¼ W.
R514	100,000 ohms, ¼ W.
R515	5,600 ohms, ¼ W.
R517	.5 megohms var.
R518	220 ohms, ¼ W.
R519	68,000 ohms, ¼ W.
R520	15,000 ohms, ¼ W.
R521	12,000 ohms, ¼ W.
R522	47,000 ohms, ¼ W.
R523	47,000 ohms, ¼ W.
R524	150 ohms, ¼ W. *
R525	3,900 ohms, ¼ W.
R550	2.2 megohms, ¼ W.
R551	470,000 ohms, ¼ W.
R552	1 megohm, ¼ W.
*R553	1 megohm, ¼ W.
R554	470 ohms, ¼ W.
R555	150 ohms, ¼ W.
R556	150 ohms, ¼ W.
R557	220 ohms, ¼ W.
‡R558	100 ohms, ¼ W.
‡R561	100 ohms, ¼ W.
R562	3,900 ohms, ¼ W.
R563	2,700 ohms, ½ W.
†R564	1 megohm, ¼ W.
INDUCTANCES	
L501	R.F. grid coil
L502	R.F. plate coil
L503	M.O. cathode/filament choke
L504	I.F. amplifier coil
L505	R.F. choke
L506	Quench osc. coil
L508	Local osc. grid coil
L550	Aerial coupling coil
L551	R.F. choke
L552	M.O. coil
TRANSFORMERS	
T550	Receiver output and driver
T551	Modulator
T552	Microphone
MISCELLANEOUS	
PL500	Aerial socket
S500	Band change switch
S501	Aerial relay
S502	Send-receive relay

*On sets below Serial No. 201, R555 was 2.2 megohms.
‡Certain sets may use 82 ohms, ½ W.
†Added after Serial No. 200.

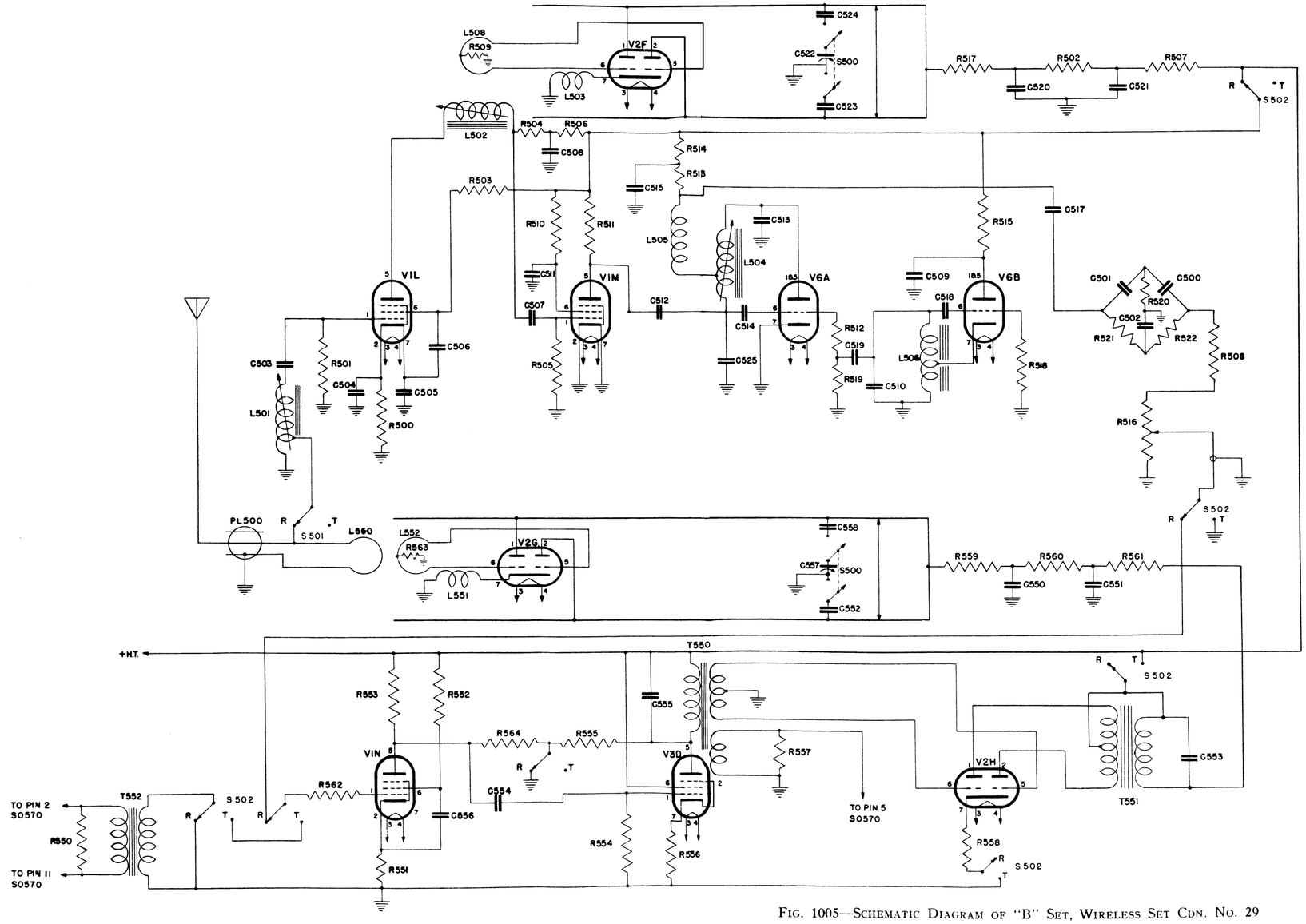
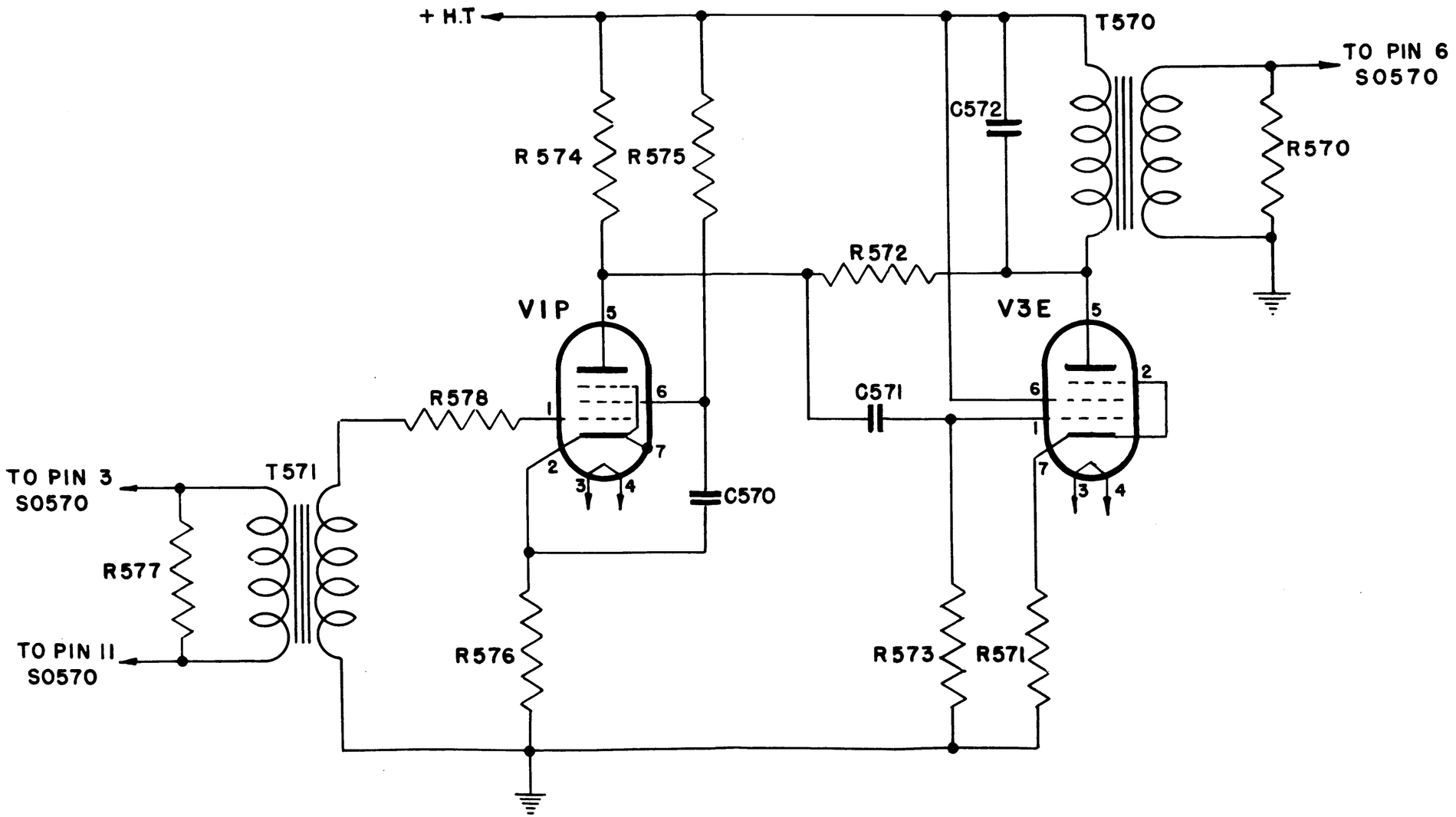


FIG. 1005—SCHEMATIC DIAGRAM OF "B" SET, WIRELESS SET CDN. NO. 29

TABLE 1004—LIST OF COMPONENTS (FIG. 1006)

Circuit Ref.	Function or Value
CONDENSERS	
C570	.01 uF., 400 V.
C571	.001 uF., 500 V.
C572	.003 uF., 800 V.
RESISTORS	
R570	150 ohms, ¼ W.
R571	470 ohms, ¼ W.
R572	2.2 megohms, ¼ W.
R573	1 megohms, ¼ W.
R574	470,000 ohms, ¼ W.
R575	2.2 megohms, ¼ W.
R576	3,900 ohms, ¼ W.
R577	150 ohms, ¼ W.
R578	3,900 ohms, ¼ W.
MISCELLANEOUS	
T571	Microphone input transformer
T570	Output transformer
S572	I.C. ON-OFF switch

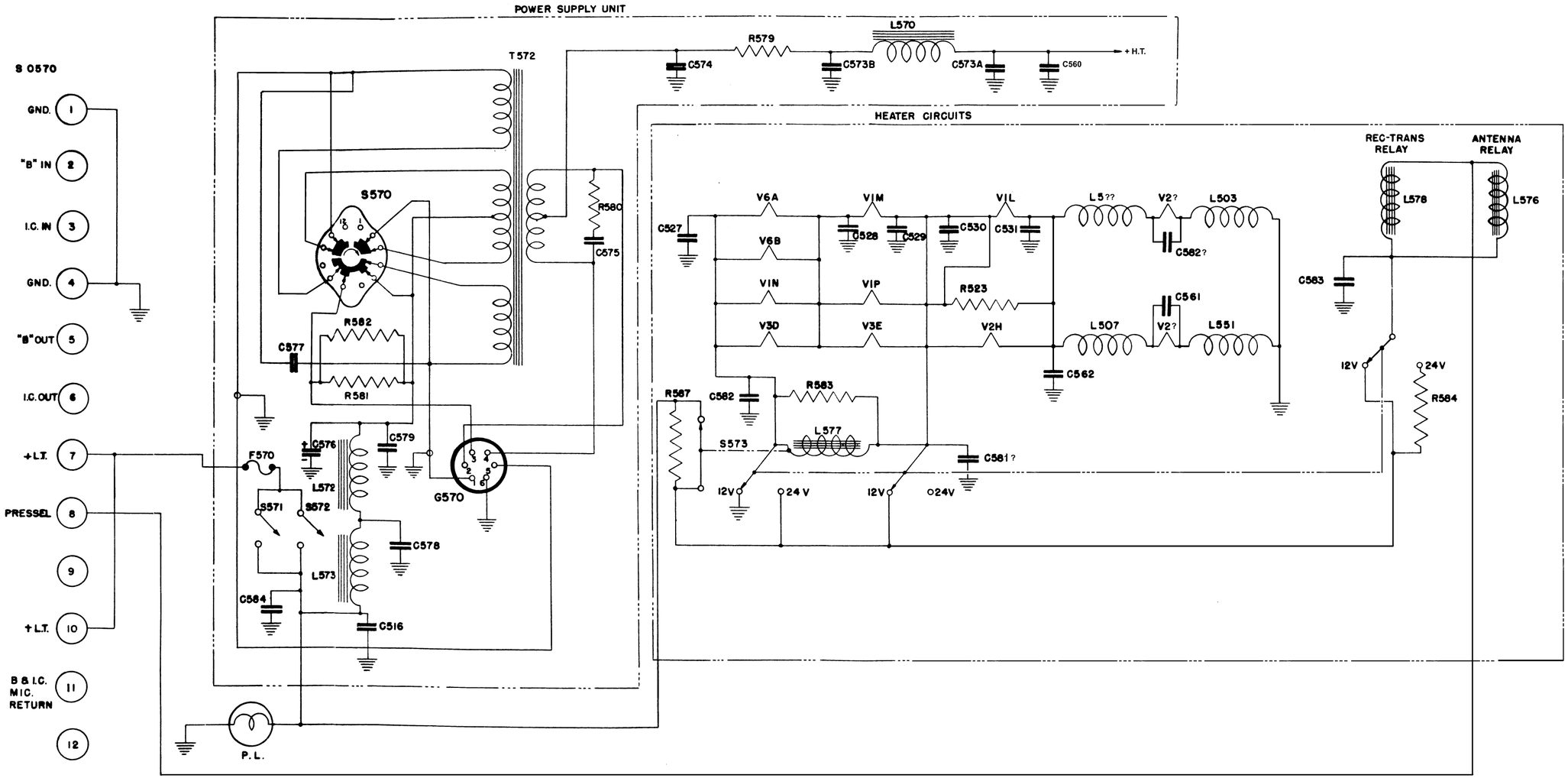


DME 85188

FIG. 1006—SCHEMATIC DIAGRAM OF I.C.-AMPLIFIER, WIRELESS SET CDN. No. 29

TABLE 1005—LIST OF COMPONENTS (FIG. 1007)

Circuit Ref.	Function or Value
CONDENSERS	
C516	470 uuF., 500 V.
C526	47 uuF., 500 V.
C527	470 uuF., 500 V.
C528	470 uuF., 500 V.
C529	470 uuF., 500 V.
C530	470 uuF., 500 V.
C531	470 uuF., 500 V.
C561	47 uuF., 500 V.
C562	470 uuF., 500 V.
C573A-B	16 uF., 400 V.
C574	470 uuF., 500 V.
C575	.01 uF., 1500 V.
C576	500 uF., 30 V.
C577	.25 uF., 200 V.
C578	.1 uF., 400 V.
C579	.25 uF. 200 V.
C580	470 uuF., 500 V.
C581	470 uuF., 500 V.
C582	470 uuF., 500 V.
C583	470 uuF., 500 V.
C584	470 uuF., 500 V.
RESISTORS	
R523	39 ohms, 5 W.
R579	47 ohms, ½ W.
R580	15,000 ohms, ¼ W.
R581	82 ohms, ½ W.
R582	82 ohms, ½ W.
R583	150 ohms, 2 W.
R584	47 ohms, 5 W.
R578	½ ohm, 10 W.
INDUCTANCES	
L503	M.O. cathode filament choke
L507	L.O. filament choke
L551	L.O. cathode-filament choke
L555	M.L. filament choke
L570	Filter choke
L572	Input filter choke
L573	Input filter choke
L576	Aerial relay coil
L577	Over-voltage relay coil
L578	Send-receive relay coil
SWITCHES	
S570	12-24 V.
S571	"B" L.T. ON-OFF
S572	I.C., L.T. ON-OFF
S573	Over-voltage relay
MISCELLANEOUS	
S0570	Control unit socket
G570	Vibrator
F570	L.T. fuse
T572	Vibrator transformer

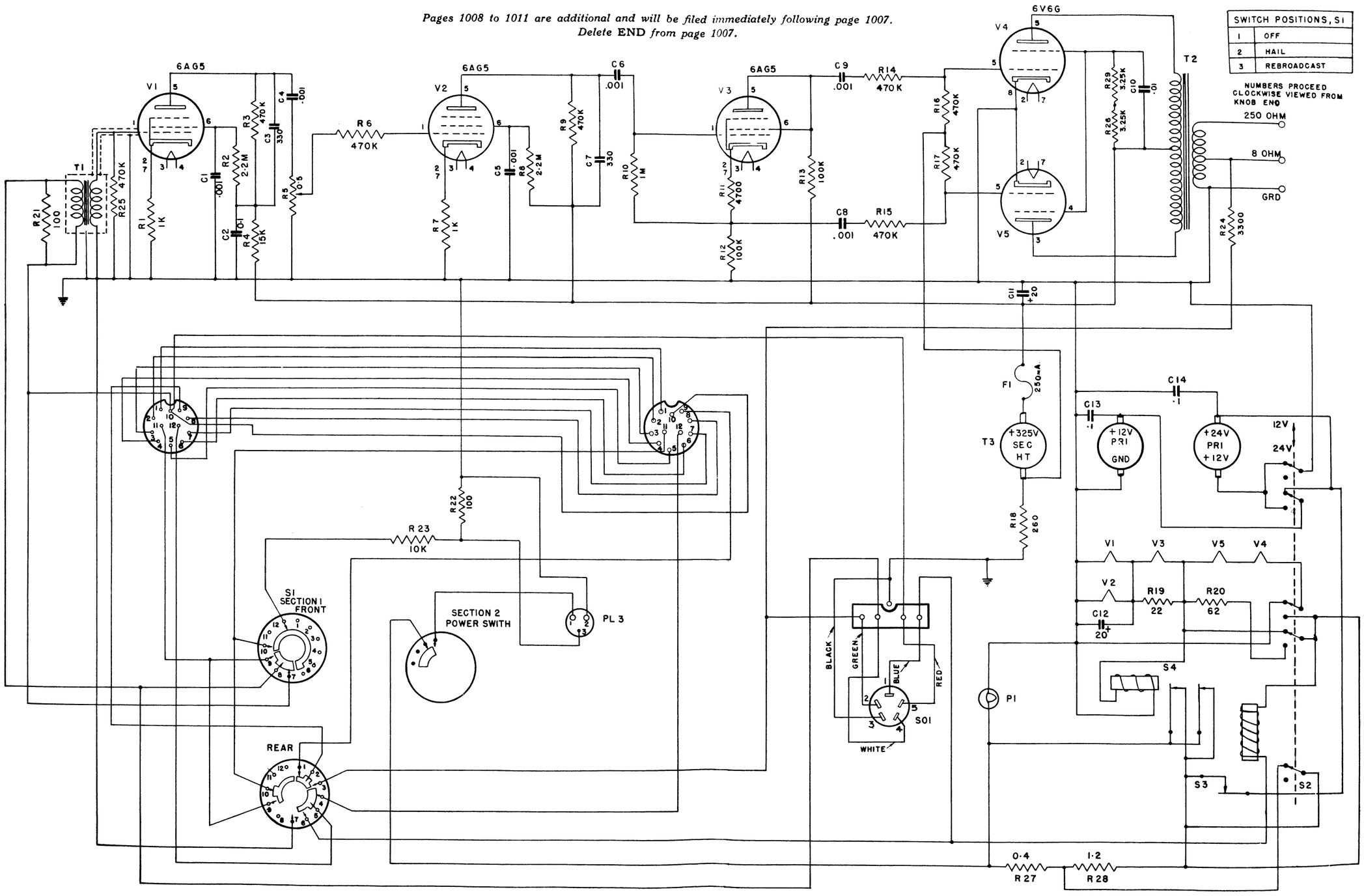


DME 85184

FIG. 1007 - Schematic Diagram of B-I.C. SUPPLY UNIT, WIRELESS SET CDN. NO. 29

END

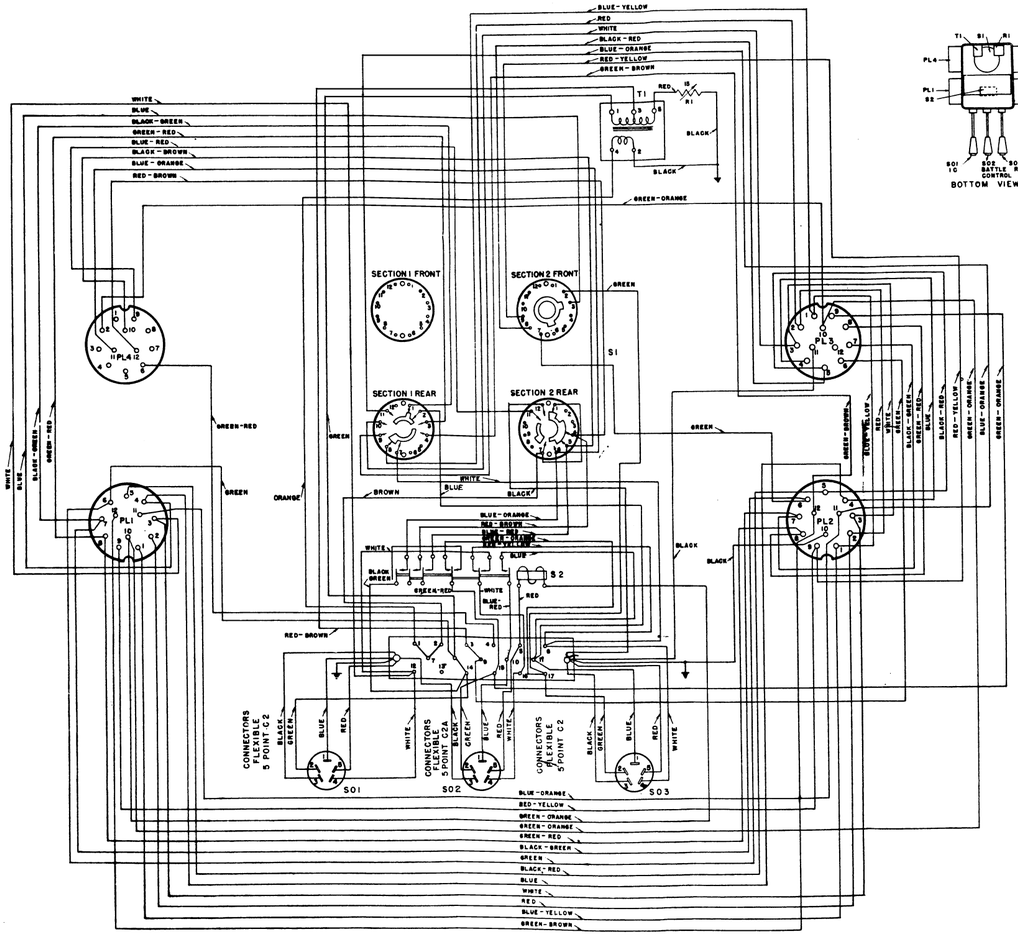
Pages 1008 to 1011 are additional and will be filed immediately following page 1007.
Delete **END** *from page 1007.*



NOTE 1—S1 shown **as viewed from knob end in fully counterclockwise "OFF" position.**

NOTE 2—S2 shown **in 12V-position.**

FIG 1008—SCHEMATIC DIAGRAM OF AMPLIFIER AF No. C1 WIRELESS SETS CDN No. 29



CIRCUITS OF PINS OF PLUG MOUNTINGS

PIN	PLUG	CIRCUIT
1	PL 1,2,3	A SET MIC
2	PL 1,2,3	B SET MIC
3	PL 1,3,3	1/C AMP MIC
4	PL 1,3,3	A SET TEL
5	PL 1,1,2,3	B SET TEL
6	PL 1,2	1/C AMP TEL WITH MONITOR
6	PL 3	PURE TC
6	PL 4	1/C SPARE
7	PL 1,2,3	A SET RELAY
8	PL 1,2,3	B SET RELAY
9	PL 1,2	D SET TEL
9	PL 3	SIGNAL
10	PL 4	A SET UNATTENDED
10	PL 1,3	+ 12V LINE
11	PL 1,2	D SET MIC
11	PL 3	MIC RETURN
11	PL 4	A SET MONITOR
12	PL 1,2	D SET RELAY
8	PL 4	+ 12 V LINE
12	PL 4	B SET MONITOR
9	PL 4	D SET MONITOR
10	PL 2	MIC RETURN

CIRCUITS OF CONTACTS ON RADIO AND I/C CONNECTORS FLEXIBLE 5 POINT C2 (S01 & S03)

1	RELAY
2	TELEPHONE
3	TELEPHONE & GROUND
4	MICROPHONE
5	MICROPHONE RETURN

CIRCUITS OF CONTACTS ON R COMMANDERS CONNECTORS FLEXIBLE 5 POINT C2A (S02)

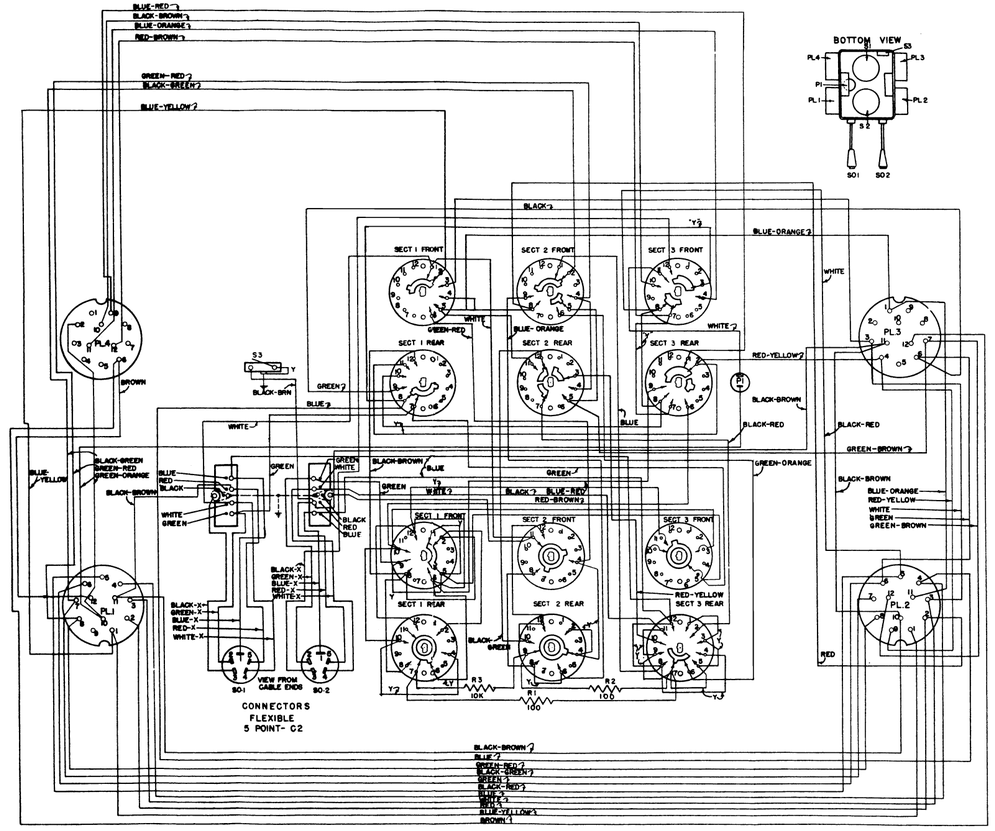
1	RELAY
2	TELEPHONE
3	GROUND RETURN
4	MICROPHONE
5	BATTLE CONTROL RELAY

FIG 1009—SCHEMATIC DIAGRAM OF CONTROL UNIT NO. C101 WIRELESS SETS CDN

NOTE 1—S1 shown as viewed from knob end.

NOTE 2—S2 shown in normal position.

NOTE 3—Switch sections are numbered from knob end.



ROTARY SWITCHES POSITIONS

	S1		S2
1	A	1	B A
2	I/C	2	A B B
3	B	3	A B
4	D	4	LISTEN ALL
5	R	5	D B
		6	B B D
		7	B D
		8	L/B B D
		9	A D
		10	A B D
		11	D A
		12	L/A B B

S1 IN EXTREME COUNTERCLOCKWISE POSITION

INDICATES POSITION IN WHICH SWITCHES ARE SHOWN.
NUMBERS PROCEED CLOCKWISE AS VIEWED FROM KNOB END.

CIRCUIT OF PINS OF PLUG MOUNTINGS

PIN	PLUG	CIRCUIT
1	PL 1,2	A SET MIC
1	PL 3	D SET MIC
2	PL 1,2	B SET MIC
2	PL 4	+12 V. LINE
3	PL 1,2,3	1/C AMP MIC
4	PL 1,2	A SET TEL
4	PL 3	D SET TEL
5	PL 1,2	B SET TEL
6	PL 1,2,3	1/C AMP TEL
6	PL 4	1/C SPARE
7	PL 1,2	A SET RELAY
8	PL 1,2	D SET RELAY
8	PL 1,2	B SET RELAY
10	PL 1,3	B SET RELAY
9	PL 4	D SET MONITOR
9	PL 2	D SET TEL
10	PL 4	A SET UNATTENDED LIGHT
10	PL 1	+12 V LINE
11	PL 4	A SET MONITOR
11	PL 2	D SET MIC
11	PL 1,3	MIC RETURN
12	PL 4	B SET MONITOR
12	PL 2	D SET RELAY
12	PL 1,3	I/C SPARE

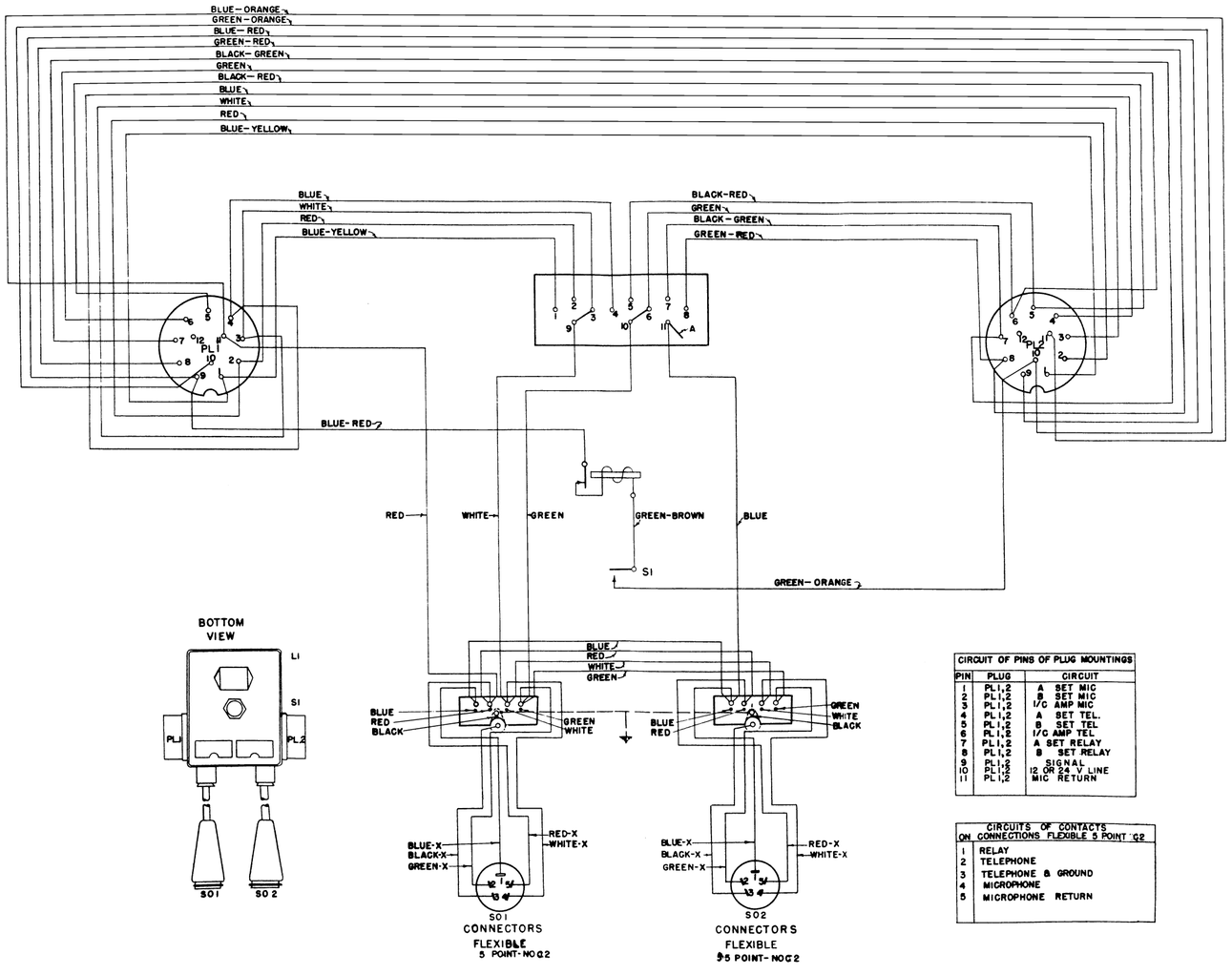
CIRCUIT OF CONTACTS ON CONNECTORS FLEXIBLE 5 POINT C2

1	RELAY
2	TELEPHONE
3	TELEPHONE & GROUND
4	MICROPHONE
5	MICROPHONE RETURN

FIG 1010—SCHEMATIC DIAGRAM OF CONTROL UNIT NO. C102 WIRELESS SETS CDN NO. 29

NOTE 1—All switches shown as viewed from knob end.

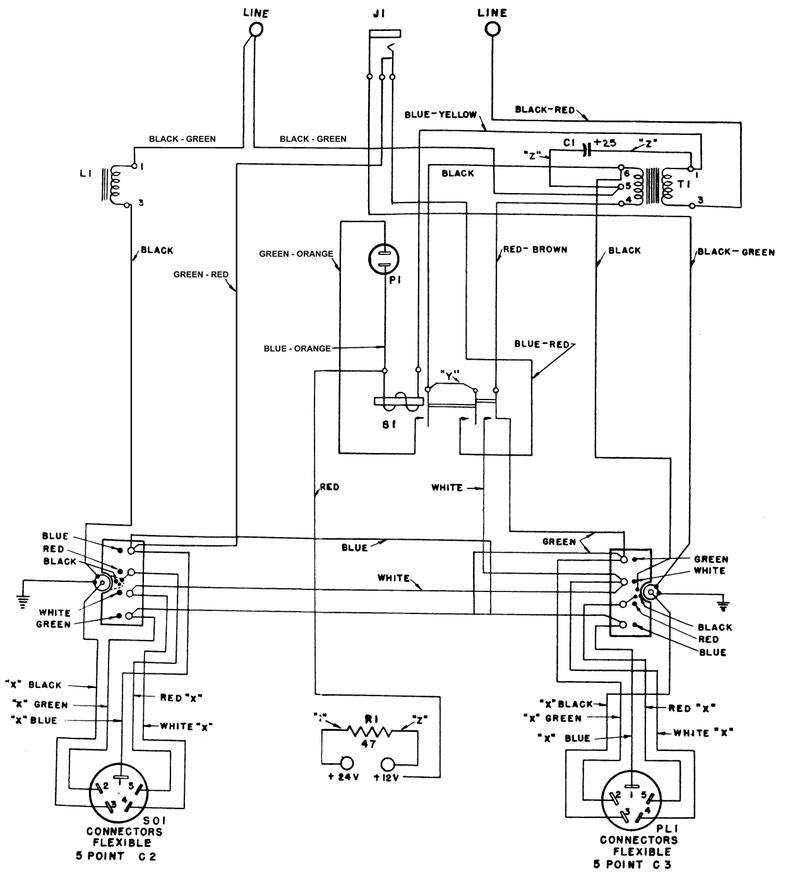
NOTE 2—Switch sections are numbered from knob end.



CIRCUIT OF PINS OF PLUG MOUNTINGS		
PIN	PLUG	CIRCUIT
1	PL1,2	A SET MIC
2	PL1,2	B SET MIC
3	PL1,2	I/C AMP MIC
4	PL1,2	A SET TEL.
5	PL1,2	B SET TEL
6	PL1,2	I/C AMP TEL
7	PL1,2	A SET RELAY
8	PL1,2	B SET RELAY
9	PL1,2	SIGNAL
10	PL1,2	12 OR 24 V LINE
11	PL1,2	MIC RETURN

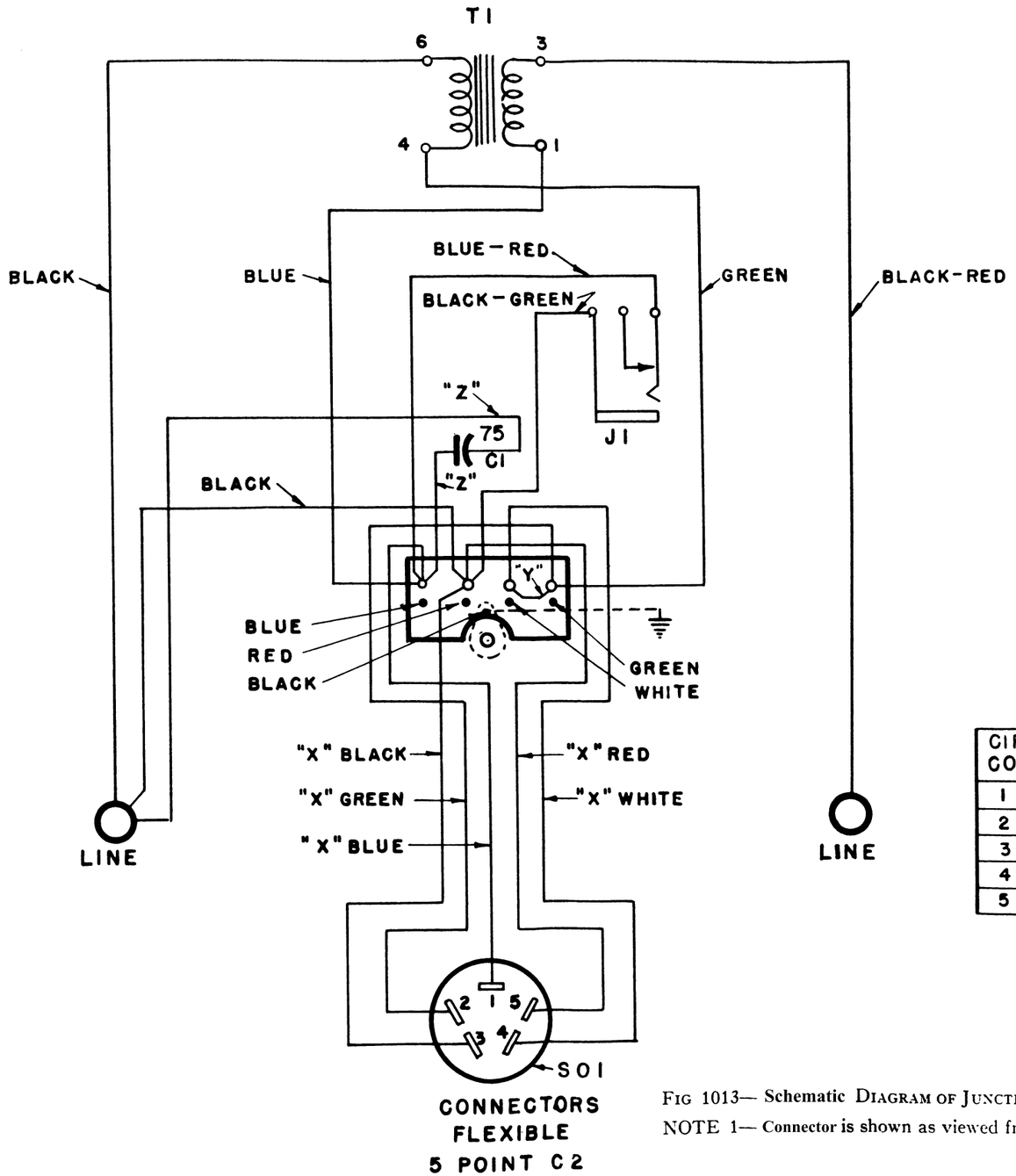
CIRCUITS OF CONTACTS ON CONNECTIONS FLEXIBLE 5 POINT 'C2	
1	RELAY
2	TELEPHONE
3	TELEPHONE & GROUND
4	MICROPHONE
5	MICROPHONE RETURN

FIG 1011—SCHEMATIC DIAGRAM OF CONTROL UNIT NO. C103 WIRELESS SETS CDN NO. 29
NOTE 1—Plugs are shown as viewed from wiring side.
NOTE 2—Connectors are shown as viewed from cable end.

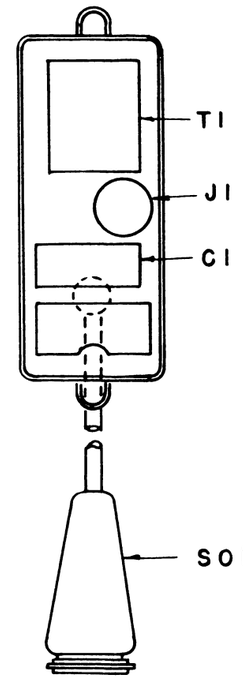


CIRCUITS OF CONTACTS ON CONNECTORS FLEXIBLE 5 POINT C2 & C3 (S01 & PL1	
1	RELAY
2	TELEPHONE
3	TELEPHONE & GROUND
4	MICROPHONE
5	MICROPHONE RETURN

FIG 1012— Schematic DIAGRAM OF JUNCTION REMOTE CONTROL NO. C101 WIRELESS SETS CDN NO 29
NOTE 1— Connectors are shown as viewed from cable end.



BOTTOM VIEW



CIRCUITS OF CONTACTS ON CONNECTORS FLEXIBLE 5 POINT C 2	
1	RELAY
2	TELEPHONE
3	TELEPHONE & GROUND
4	MICROPHONE
5	MICROPHONE RETURN

FIG 1013— Schematic DIAGRAM OF JUNCTION REMOTE CONTROL NO. C102 WIRELESS SET CDN NO. 29

NOTE 1— Connector is shown as viewed from knob end.

END