77. MODEL GF-2 TRANSMITTER EQUIPMENT

Type CBY-52028 transmitter consists of a set-box including the circuits and tuning elements required for the generation, amplification, and modulation radio currents, including the supply and coupling terminals, tube sockets, power terminals, and plug-in coil terminals.

Electrically the transmitter comprises a radio-frequency oscillator, a radio-frequency amplifier, a coupling circuit for transferring radio-frequency power from the amplifier to the antenna, and a modulator stage for amplifying either internal or external modulation currents and modulating the radio-frequency amplifier therewith. The modulator tube also acts as a tone oscillator, generating an audio frequency modulating current for MCW telegraphy. The radio oscillator is a type 89 tube connected as a triode, with the plate, suppressor and screen grids connected together to form the single anode. The radio amplifier stage consists of two type 837 pentodes connected in push-pull. The modulator-audio-oscillator tube is a second type 89 tube connected as a pentode.

Fig. 77 shows cabling diagram for model GF-2 equipment. Fig. 78 shows a schematic circuit diagram while Fig. 79 shows a wiring diagram of the transmitter, extension control box, transmitter control box and antenna relay unit.

The radio oscillator circuit comprises coil assembly I22, variably tuned by a condenser II6, which is operated by the frequency control knob to which is connected a dial. The dial is graduated in equal divisions from 0 to 30, each division corresponding to one rotation of the knob, which is itself graduated 0 to 100. Condenser II7 is a fixed air condenser connected in shunt with II6 and mounted in the same frame. Condenser I20 is a small adjustable air condenser also mounted in the same frame and adjustable with a screw-driver through the shaft which is accessible through an aperture under the cover.

The function of condenser 120 is to compensate, by small changes in the capacity of the oscillator circuit, for frequency changes introduced when the oscillator or amplifier tubes are changed. The radio oscillator has a grid condenser II0 and a grid resistor I00. The combination plate-electrode of the oscillator is maintained at ground potential for radio frequencies by the by-pass condenser III. The cathode is connected to an intermediate point in the primary of the oscillator coil assembly and the control grid is connected to the end of the coil fartherest from the plate. The oscillator feeds the control grids of the two 837 amplifier tubes through the center-tapped secondary of the oscillator coil assembly I22. These 837 amplifier tubes have their cathodes connected together and grounded. Between ground and the center tap on the oscillator coil secondary is a grid resistor I03 by-passed by condenser II3. The control grid current of both amplifier tubes flow

through this resistor, and generate the grid bias voltage for the tubes. The suppressor grids, connected to terminal 46 of the power plug receptacle are also connected through resistor 102 to the control-grid side of the bias resistor 103. If terminal 46 is grounded externally, the suppressor grids are thus at ground potential (cathode potential of the amplifier tubes). But if terminal 46 is left open, the suppressor grids are maintained at a negative potential with respect to the cathodes, by the amount of the control grid bias voltage developed across resistor 103. The characteristics of the 837 amplifier tube are such that their amplification is very nearly proportional to the voltage of these suppressor grids with respect to the cathodes. When the suppressor grids are at ground (cathode) potential, the amplification of the stage, and hence the radio current output is a maximum and cannot be increased by increasing the potentials of the suppressor above ground potential. But as the potential of the suppressors is decreased below ground (cathode) the radio output of the stage decreases progressively until it reaches zero. The radio output of the stage may be modulated from zero to peak output by varying the suppressor voltage from zero for peak output, to a certain negative value for zero output (cutoff). The oscillator amplitude and bias and supply voltages are so proportioned in this stage that the radio output becomes zero at about 100 volts negative on the suppressor grids. Thus if the suppressor grids are permanently biased at about 50 volts negative, and a modulating voltage of 50 volts peak value is impressed on them, the output of the stage will be one hundred percent modulated. When the control circuits are set for the transmission of modulated signals (either voice or tone), terminal 46 is left open, and this negative bias voltage of about 50 volts is impressed on the suppressor grids in virtue of their connection to the negative side of resistor 103. In this condition the unmodulated or carrier current output of the stage is approximately one-half the current output which would be obtained if the suppressor grids were grounded, and the output may be modulated as described above, by varying the suppressor potential at the modulating frequency. But if unmodulated CW signals are to be transmitted, terminal 46 may be grounded externally, and the current output of the amplifier is then twice the current output which was obtained when the suppressors were biased negatively for modulation. This doubled current output when the suppressors are grounded for CW transmission is just equal to the maximum current which can be obtained at a modulation peak when the suppressors are biased for modulation. Resistor 102 is a stand-off resistor inserted between the control grid circuit and the suppressor circuit so that when the suppressors are grounded externally through terminal 46 the bias resistor 103 will not be short-circuited. The push-pull

plate circuit of the 837 amplifier tubes feeds the antenna circuit through the primary and secondary coils of coil assembly 121. In parallel with a portion of the secondary of this coil assembly is the variable condenser 118. The capacity of this condenser decreases in the direction of the arrow engraved on the knob. The antenna binding post 446 is connected to this secondary coil through ammeter 119 by the adjustable tap 238. Plate voltage is supplied to both amplifier tubes from terminal 55 which is connected through the oscillator amplifier plate-current jack 129 to the center-tapped plate coil of assembly 238. Screen grid voltage is supplied to the tubes through this same terminal, but the voltage on the screen grids is reduced to approximately one-half the plate voltage by a drop resistor 106. 124 is a screen-grid by-pass condenser. 130 is a radio-frequency by-pass condenser for the suppressor grids and 125 is a by-pass condenser for the plate supply line. Resistors 123, which are included inside the oscillator coil shield, serve to equalize the control-grid excitation over the frequency range covered by any one transmitter coil set.

The modulator-oscillator pentode will be considered first as a modulator. The cathode is connected to the positive 12-15 volt terminal 45, thus providing a negative bias of this amount for the control grid. 56 is a terminal for external modulating voltage; such a voltage impressed between 56 and the cathode terminal 45, acts across the primary MF of the "microphone transformer" 126. Resistor 105, connected across terminals 45 and 56, is in shunt with the external modulating source and serves to limit the voltage which can be impressed on the grid circuit from this source. This voltage is stepped up by a factor of about 25 to 1 in the secondary GE, which impresses this voltage upon the control grid of the tube through the grid resistor 100. The control grid circuit is returned to ground potential through terminal 47 or through winding 3-4. Positive voltage is supplied to the plate from 57, through the modulator plate-current jack 128, drop resistor 108 winding 1-2 of transformer 114. The suppressor grid is connected to the cathode. Positive potential less than that of the plate is supplied to the screen grid through drop resistor 101, by-passed by condenser 109. The amplified output of the tube passes through the plate transformer 127. The high secondary terminal of this transformer, 3, is connected through two paths, condenser 112, and resistor 104, to the respective power plug terminals 99 and 54. When 99 is connected externally to 46, the output of this tube and transformer modulates the radio output of the push-pull amplifier stage by varying the voltage of the suppressor grids of this stage, as described in the preceding paragraph. Terminal 54 is never connected to any other point in the transmitter circuit; it constitutes an outlet for modulation current to the side-toned and I.C.S. circuits of the equip-

ment. Transformer 114 is a tone oscillator coil assembly. One coil , 3-4, is connected in the control grid circuit of the tube and the second coil, 1-2, is in the plate circuit. The coils are so coupled that the tube can oscillate at an audio frequency (about 1000 cycles) determined by the constants of the transformer and condenser 115. When the tube does so oscillate, the audio output of the plate circuit passes through transformer 127, and is available at terminal 3 for modulating the radio amplifier, or for side tone, or both. For transmission of external modulation impressed between terminals 45 and 56, terminal 47 is grounded externally, which short-circuits coil assembly 114 and stops the audio oscillation.

Terminal 53 is a ground terminal. The heaters of the two 89 tubes are connected in series between the ground negative terminal and 45. The heaters of the 837 amplifier tubes are connected in parallel between these two terminals. Access to the two jacks 128 and 129 may be obtained through two covers in the transmitter case. A meter plugged into jack 128 reads the combined plate and screen current of the modulator tube. A meter plugged into jack 129 reads the combined plate and screen current of the radio oscillator and the two radio amplifier tubes. The sum of these two current readings may be used to compute the total power input to the transmitter from the dynatron unit.

Four transmitter coil sets are supplied, whose frequency ranges are as follows:

Type	Range
47089 A	3000 - 3675 Kc
47089 B	3675 - 4525 Kc
47089 C	6000 - 7350 Kc
47089 D	7350 - 9050 Kc

These coil sets are plugged in at the side of the transmitter, in the same way as the receiver coil sets, and are secured by snapslides. Each coil set includes two shields, which house the oscillator coil assembly 122, with resistors 123, and the amplifier coil assembly 121. The circuits of every coil set are like the circuits of every other coil set. The coil sets differ only in the number of turns on the coils and the values of resistors 123. Three coil set containers, Type CBY-47092 are furnished with each equipment to house coil sets not in use.

The Type CBY-52014 Transmitter mounting base is similar to the Type CBY-46011 Receiver mounting base, except that the dimensions of the frame are different. It is provided with shock-proof mounting cups having snapslide studs to which the transmitter is secured by four snap-slides on mounting bracket.

TRANSMITTER CONTROL BOX

Type CBY-23047 Transmitter control box is a small unit

primarily identified with the control of the transmitter. It carries a selector switch, a telegraph key, a microphone jack, an indicator lamp, and a plug receptacle. This Control Box carries besides the telegraph key one manually operated control, the three-position switch 141. Switch 141 selects the type of transmission from the transmitter. It has a center position "CW", a side position "MCW" and a second position "VOICE". Terminal 41 of the plug receptacle is wired through resistor 53 to the ring contacts of the microphone jack 138, which accomodates a three-way microphone plug. The sleeve contact of the jack 138 is grounded. The tip contact is connected through the terminal 50 to the power relay 156 and the antenna relay 289. The telegraph key 139 also closes the circuit between terminal 50 and ground. Adjusting screw 142 may be used to adjust the spacing between the key contacts. It may also be used to lock the key for test purposes. Terminal 52 is grounded and the remaining terminals are connected to various contact springs of the switch 141. The construction and operation of this switch is similar to that of switch 134 in the Type CBY-23046 Receiver Switch Box, in which the short-circuiting studs are mounted on a member rotated by the switch handle, and stop between the various pairs of spring contacts. The indicator lamp 454 is a neon tube mounted in a recess in the Control Box case, and visible to the operator through apertures in the protecting cover. It is connected through a protective resistor 62 to the high voltage terminal 40 and glows when the transmitter voltage is on this terminal.

Type CBY-23047 Transmitter Control Box is not interchangable with Type CBY-23045 Transmitter Control Box.

EXTENSION CONTROL BOX

Type CBY-23048 Extension Control Box is a unit the same size as the Transmitter Control Box and is provided for use by the pilot in two-seat airplane installations. It carries a two-way toggle switch 239 having two positions "ICS" and "RADIO". It also carries a telephone jack 133A, a variable resistor 64, a telegraph key 139, and an indicator lamp 454. The telephone jack is wired into the common telephone receiver circuit of the entire equipment, through terminal 94. Resistor 64 is a level-adjusting resistor in series with this jack, to permit the operator of this Control Box to adjust independently the level of the received signal in his telephones. This resistor is controlled by an external knob. The sleeve of the microphone jack is grounded, and the ring and tip contacts are connected, through terminals 90 and 91, in parallel with corresponding microphone contacts on the Transmitter Control Box. The key is connected between 91 and ground. The indicator lamp 454 is connected through resistor 62 between ground and the high voltage terminal 96, and serves the same purpose as the similarly numbered lamp in the Transmitter Control Box. The remaining contacts of the receptacle are

connected to the toggle switch 239.

ANTENNA RELAY UNIT

Type CBY-23049 Antenna Relay is a unit containing a two position relay, two binding posts for connection to Receiver and Transmitter, one antenna binding post, and a receptacle for the plug of Cable 77, which connects it to the Junction Box. Its function is to switch a common antenna between Receiver and Transmitter in installations where one antenna is used for both receiving and transmitting. The antenna binding post is connected to the movable contact of one relay element. When the relay is not energized this movable contact rests on a fixed contact which is connected to the "REC" binding post. When the relay is energized this movable contact is brought to a second fixed contact which is connected to the "TR" binding post. In addition the relay has an independent pair of contacts which are open in the non-energized (REC) position and which ground the Receiver binding post in the energized (TRANS) position. The coil of the relay is connected through cable 77 across the coil of the power relay 156 in the Junction Box so that both relays are energized simultaneously by the key on the Transmitter Control Box, a switch on the microphone plugged into jack 138, or the CBY-24004 Transmitter Remote Control.

TRANSMITTER REMOTE CONTROL

Type CBY-24004 Transmitter Remote Control consists of a push-button switch adapted for mounting on an airplane throttle lever, and connected to the Junction Box through cable 175. It is connected into the circuit between terminal 50 of the Junction Box and ground, when cable 175 is plugged into receptacle 174.

If operation of the Transmitter by means of a remote telegraph key is desired, this key may be connected through a cable similar to 175 to the Junction Box in place of the Transmitter Remote Control Switch.

CABLES

The following cables are included in Model RU-3A and GF-2 Equipment:

Cable	Number of Conductors.	Use
121	2	Dynamotor to 12-15 volt source.
233	11	Junction Box to Receiver.
134	6	Junction Box to Dynamotor Unit.
135	8(7 in use)	Junction Box to Receiver Switch Box.
236	10(9 in use)	Junction Box to Transmitter.
37	8	Junction Box to Transmitter.
80	8(7 in use)	Junction Box to Extension Control Box.
77	2	Junction Box to Antenna Relay Unit.
175	2	Junction Box to Transmitter Remote Control.

An additional Plug, D-80, is supplied to replace the Extension Control Box Cable, 80, in single-seat installations.

Each cable is shielded with tinned copper braid and all but the battery cable, 121, terminate at each end with a suitable plug. The battery cable is terminated at one end in a plug which fits into a Junction Box receptacle and at the other end in a ferrule designed to be clamped to a suitable threaded outlet by means of a nut which is supplied on the cable. This nut has an 11\16" - 24 thread in accordance with Drawing No. 213017 of the Naval Aircraft Factory, Philadelphia, Pa.

COOPERATION OF UNITS

The units of Model GF-2 Transmitter Equipment do not constitute a complete self contained transmitting equipment. These units are designed solely for operation in conjunction with Model RU-3A Receiving Equipment, and when combined with Model RU-3A as herein described, provide a complete Model GF-2 Transmitting and Receiving Equipment. Consequently in this and succeeding section of this pamphlet, the operation of the Transmitter and associated units will be described, which for clarity, will include all units of an operative transmitting and receiving installation.

In an operating installation, when the various units of Model GF-2 equipment are connected through cables to the Junction Box and to the 12-15 volt source each terminal in the Junction Box is connected through a cable to the terminal bearing the same number on one of the operating units.

Switch 155 in the Junction Box must be set in its "TRANS-REC" position. It then completes the 12-15 volt supply line to both the Receiver and the Transmitter. (The purpose of the "REC ONLY" position of this switch is to cut out the 12-15 volt line to the Transmitter for the purpose of saving power, when one-way reception only is desired).

Current is drawn from the 12-15 volt source through the positive supply line from terminal 97 through 15, fuse 158, and terminal 83 in the Receiver Switch Box. When switch 134 is in its "OFF" position there is no voltage on the Dynamotor, Transmitter or Receiver, for all positions of the other controls. When this switch is thrown to either of its operating positions the primary supply line is connected to terminal 86 from which it is distributed to the vacuum tubes in the Receiver and Transmitter, and also to terminal 19 to the winding of the Dynamotor relay; contacts of this relay close, connecting motor winding of the Dynamotor, through a choke and a fuse to terminal 97. Thus throwing 134 to either "AUTO" or "MAN" starts the Dynamotor through the relay 147. High voltage from Dynamotor unit at terminal 18 may be impressed on either the Receiver or terminal 55 of the Transmitter (but not both at once) depending upon the position of the Junction Box Relay. The coil of this relay is supplied with voltage from the primary source through 86, and the circuit is completed to ground independently through each of five manual throw-over controls.

When this circuit from the relay coil is closed to ground the relay armature throws to the left and high voltage from 18 is led through contact A and terminal 55 to the radio oscillator and amplifier tubes of the transmitter. The Plate voltage is on the modulator tube through terminal 57 at both positions of the relay. When the relay coil circuit is open the relay armature drops back to its "Receive" position and contact A throws to the right, connecting the high voltage terminal 18 to the Receiver terminal 80. A second single-pole double-throw contact, B, is operated by the relay.

In the "Transmit" position this contact short circuits resistors 152 and 151 in the dynamotor unit base, which causes the entire dynamotor voltage to be impressed between the cathodes (ground) and plates of the Transmitter radio tubes. In the "Receive" position this contact open circuits the dynamotor unit resistors so that they may furnish negative bias voltage for the receiver, and also grounds the terminal 47 of the transmitter thus short-circuiting the tone oscillator coil 115 and making it impossible for the modulator tube to oscillate.

For remote control of the throw-over operation between transmit and receive, Type CBY-24004 transmitter remote control should be plugged into receptacle 174. When the switch button of this remote control is depressed, relay 156 is energized and the high voltage is impressed on the transmitter. The same operation is performed by operating a microphone switch connected between ground and the TIP CONTACT of jacks 138 and 138A in the control boxes. The same operation is performed by depressing the telegraph key on either control box. When relay 156 is in its "Receive" position (Remote control switch up, both telegraph keys up, both microphone switches up) the transmitter does not operate, and the same voltages from the dynamotor unit are impressed upon the various circuits of the receiver as when the Junction Box toggle switch is in its "REC-ONLY" position.

In the "Receive" position of the throwover controls the circuits of the receiver are energized as follows, for the two operating positions of the switch box switch 134. In the "MANUAL" position of the voltage divider 33, energized through drop resistor 157 from terminal 18 of the dynamotor unit, supplies high positive voltage to the plates of all tubes except the A.G.C. tube and to the screen grid of the detector; it also supplies from the center tap a lower positive voltage to the screen grids of the radio amplifiers. The plate and screen grids of the A.G.C. tube are returned to ground; the cathode is maintained at a negative voltage below ground by its connection through 77 and 17 to the voltage divider resistor maintained at a more negative voltage below ground by its connection through 78 and 14 to the negative terminal of the dynamotor. Telephone receivers at jacks 133 and 133A are connected to the output circuit of triode (2) of the CRP-38233 tube. Variable resistor 132 in the switch box

is open circuited and variable resistor 131 is connected between ground and the cathodes of the three CRP-38078 radio amplifier tubes, through terminals 85 and 73. Variation of resistor 131 varies the gain of the radio amplifier. The receiver sensitivity increases in the direction of the arrow engraved on this knob which is the direction of decreasing resistance.

When relay 156 is in its "Transmit" position the high voltage terminal 18 of the dynamotor unit is connected through this relay to terminal 55 of the transmitter, which supplies plate voltage to the radio oscillator and amplifier tubes. At the same time the relay short circuits resistors 151 and 152 in the dynamotor unit so that the full output voltage of the dynamotor is impressed between terminal 55 and ground. Then for any position of the switch box switch other than "OFF" the circuits of the transmitter are controlled as follows: At all three positions of switch 141 on the transmitter control box, terminal 45 supplies 12-15 volts to the heaters of the transmitting tubes. At all three positions of this switch, terminal 55 supplies high voltage to the plate and screen-grid circuits of the radio amplifier and radio oscillator tubes, and the terminal 57 supplies high voltage to the modulator tube. At the "MCW" and "CW" positions of switch 141, terminal 47 is open, audio tone oscillations occur in the plate and grid circuits of the modulator tube, and the resulting audio voltage is impressed through resistor 104, terminals 54, 79, and the receiver output filter, upon terminal 75; 75 is connected through 87 to all telephone jacks in the system. Thus in both CW and MCW positions, an audio side-tone voltage is impressed upon telephone receivers at the receiver switch box and at the extension control box. In the "CW" position the other output terminal, 99, of the modulator tube is open, and this audio tone voltage does not modulate the radio output of the transmitter. In the "MCW" position terminal 99 is closed through 48, 49 and 46 upon the suppressor grids of the type 837 radio amplifier output tubes, and the audio output of the modulator tube modulates the radio output of the transmitter for tone telegraphy. With regard further to the connections of the output stage in the two radio-telegraph positions of selector switch 141, it will be noted that in the "CW" position (tone oscillator disconnected from power-amplifier stage) the suppressor grids of the 837 tubes are grounded through terminals 46, 49. This is the connection for maximum radio-frequency output from this stage. But when switch 141 is set for MCW transmission the suppressor grids of the 837 tubes are disconnected from ground and these grids are biased negatively for modulation in virtue of their connection through resistor 102 to the negative side of resistor 103. In the "modulating" position of switch 141, the carrier-current output of the transmitter

is reduced by an amount corresponding to the negative bias thus impressed on the suppressor grids. The voltage of these grids is then varied about this bias value, by the audio-frequency voltage which is superimposed upon the bias voltage by the coupling connection through condenser 112 to the modulator-tube output circuit. The fixed bias on these suppressor grids in the "modulating" position is so adjusted that the positive peaks of the audio modulating voltage swing the net suppressor grid voltage up to the (ground) potential of the cathodes. Thus the modulated radio output of the power amplifier stage reaches a value at the peak of the modulation cycle which is equal to the sustained amplitude of the radio output when the switch 141 is set for CW transmission.

In the third position, "VOICE", of the selector switch 141, the same negative bias as in the "MCW" position is impressed on the suppressor grids, to permit modulation at this position, however, terminal 47 is grounded through 51, short-circuiting the tone oscillator coils 114. The tone oscillation is thus suppressed and the type 89 modulator tube performs the sole function of modulation. The control grid of this tube is fed from the "microphone transformer" 126, the primary MF of this transformer being connected through 56, 41 and 90 to the microphone jacks on both control boxes. The F terminal of this transformer is connected to the modulator cathode, which is maintained at 12-15 volts above ground. Thus the ring contacts of the microphone jacks 138 and 138A are at 12-15 volts (less the drop through resistor 63) and when a microphone is plugged into either jack, its other terminal, on the sleeve contact, is connected to the negative side of the primary power source, which supplies the residual current necessary for microphone operation. Resistors 63, which are in series with the microphones in the control box and extension control box, are for the purpose of standing off the microphones from the voice input circuit of the transmitter, so that there is no appreciable difference in modulation sensitivity when one or two microphones are used. The connection to the output transformer of the modulator tube for voice transmission are as follows: one line for the transmission of side-tone goes out through resistor 104 and terminal 46; the second output line through condenser 112 is connected to the suppressor grids of the 837 tubes for modulation by the voice-frequency audio modulating voltage produced in the microphone circuit. The output of the modulator tube, for voice modulation using either one or two type RS-38 microphones, is so adjusted that the radio output of the amplifier stage on the modulation peaks is equal to the steady output of this stage during CW transmission. Thus the unmodulated radio output indicated by meter 119 is the "VOICE" position of switch 141 is equal to approximately one-half the current output indicated by this meter at the "CW" position of this switch. But when

voice modulation is impressed upon the transmitter from the microphones the reading of this radio output meter will increase above the unmodulated level of one-half the CW value, because the meter then indicates the effective value of a modulated radio wave which assumes intermittently a peak value equal to the CW value.

All of the foregoing discussion applies to operation of the receiver and transmitter when the "RADIO-ICS" switch 239 on the extension control box is set at its "RADIO" position. The "ICS" position of this switch provides for interior communication, without radiation, between one operating station at the transmitter control box and a second operating station at the extension control box. Throwing this switch from the "RADIO" to the "ICS" position produces two changes in the circuits of the equipment, as follows: (1) Terminal 93 is disconnected from terminal 91; this disconnects the junction box throwover relay 156 from all the throwover control switches (Transmitter remote control, microphone switches, and telegraph keys) so that when these switches are closed, the high voltage from dynamotor terminal 18 remains off the transmitter. (2) Terminal 95 and receiver terminal 89 are disconnected from ground; this opens the plate circuit of the CRP-38233 receiver output triode and thus disconnects the radio receiver from the telephone circuit connected to terminal 75. But the type 89 modulator tube, is still energized from dynamotor terminal 18, so that this modulator tube is operative as an audio-frequency power amplifier in the "ICS" position of switch 239. In this case, voice-frequency currents from either microphone pass into the transmitter, are amplified by the type 89 modulator tube, and are reproduced in the common telephone-receiver circuit whose outlets are jack 133 on the receiver switch box and jack 133A on the transmitter control box. But the transmitter radio oscillator and power amplifier stages are cut off, so that all voice transmissions in the "ICS" position of switch 239 are confined to the local equipment. Regardless of the position of switch 134, determining the type of radio reception, and the position of switch 141, determining the type of radio transmission, the throwover operation from "RADIO" to "ICS" on switch 239 are confined to the local equipment. Regardless of the position of switch 134, determining the type of radio reception, and the position of switch 141, determining the type of radio transmission, the throwover operation from "RADIO" to "ICS" on switch 239 makes interior communication possible between the two operating stations without radiation from the transmitter. The neon lamp indicators 454 in the transmitter control box and the extension control box glow when switch 239 is in its "radio" position, and are dark

when this switch is in its ICS position, in virtue of their connection through terminals 96 and 40 to the transmitter terminal 55. Thus when these lamps are lighted, all voice and key transmissions are sent out by radio from the system; when these lamps are dark all voice and key transmissions are confined to the local circuits.

The level-adjusting resistor 64 in the extension control box adjusts the output of telephone receivers plugged into that control box only. It does not affect telephone receivers connected to the receiver switch box. But when the receiver switch box switch 134 is set for MANUAL sensitivity control, this switch box control 131 adjusts the sensitivity of the receiver and hence will affect the strength of signals received by radio at the extension control box.

The output level from the telephone receivers at the extension control box when using the ICS system can be adjusted by resistor 64, since this operates locally only. But an operator listening on telephones plugged into the receiver switch box can adjust the ICS signal level in his telephones only when switch 134 is in the AUTO position.

Either two-way or three-way microphone plugs may be used at jacks 138 and 138A. The Type RS-38 microphone is normally connected to its plug as follows: Microphone through first switch contact to ring; Microphone return line to sleeve, spare return line, through second switch contact to tip. The microphone control button, when depressed, connects simultaneously the microphone element to the voice circuit between ring and sleeve, and the tip contact to the grounded sleeve. The tip contact, connected from the control boxes to the throw-over relay 156, throws the whole equipment to TRANSMIT when the contact is grounded (provided that the ICS-RADIO switch is on RADIO). Thus if it is desired to use the microphone control button only for connecting and disconnecting the microphone element, and not for throw-over between RECEIVE and TRANSMIT, the line from the second microphone switch contact through the tip of the jack must be disconnected somewhere between the microphone itself and the power plug terminal on the control box (50 on CBY-23047 and 91 on CBY-23048).

In the ICS position the microphone spare return lines to the tip contacts of the jacks have no function.

If the microphone switches are disconnected from the tip contacts of the microphone jacks the microphone control buttons should not be locked or depressed when the equipment is set for RECEIVE-RADIO. If this is done, the airplane noise picked up through the microphones, and amplified through the modulator tube, may drown out weak radio signals in the telephone circuits.

NOTE: The ICS jack 196 on the Type 46041 receiver is not used in the interior communication system of Model GF-2 equipment.

The coil of the Type CBY-23049 antenna relay unit is

connected into the junction box through cable 77. This coil is connected parallel with the coil of the power relay 156. Thus when the power relay 156 is thrown between RECEIVE and TRANSMIT the movable contacts of the antenna relay 289 are thrown between RECEIVE and TRANSMIT, so that if a single antenna is used for both receiving and transmitting this antenna is connected alternatively to the receiver and transmitter antenna binding posts.

Summarizing the control operations, the throw-over controls, operating both the power relay and the antenna relay, are five in number, and are all connected similarly to these two relays in the junction box. They are as follows:

(1) CBY-24004 transmitter remote control, connected through cable 175.

(2) Telegraph keys on the CBY-23047 transmitter control box and the CBY-23048 extension control box.

(3) Switches on the microphones plugged into the transmitter control box and extension control box.

Thus the transmitter may be keyed for code transmissions, at all positions of the transmitter control switch, by any one of these three types of throw-over control. Or, alternatively, the telegraph keys on the control boxes may be used to switch from RECEIVE to TRANSMIT for voice transmissions, in cases where neither a transmitter remote control or a microphone switch are provided.

Model GF-2 equipment is set for receiving, at all positions of the switch on the transmitter control box, except when either the transmitter remote control switch, one of the control box keys or one of the microphone switches is closed.

A dummy plug, 186 is provided for insertion in receptacle 169 when the Type CBY-23048 extension control box is not used. This plug connects terminals 91 to 93 and 92 to 95 so that the equipment is permanently set for RADIO when the dummy plug is substituted for cable 80.

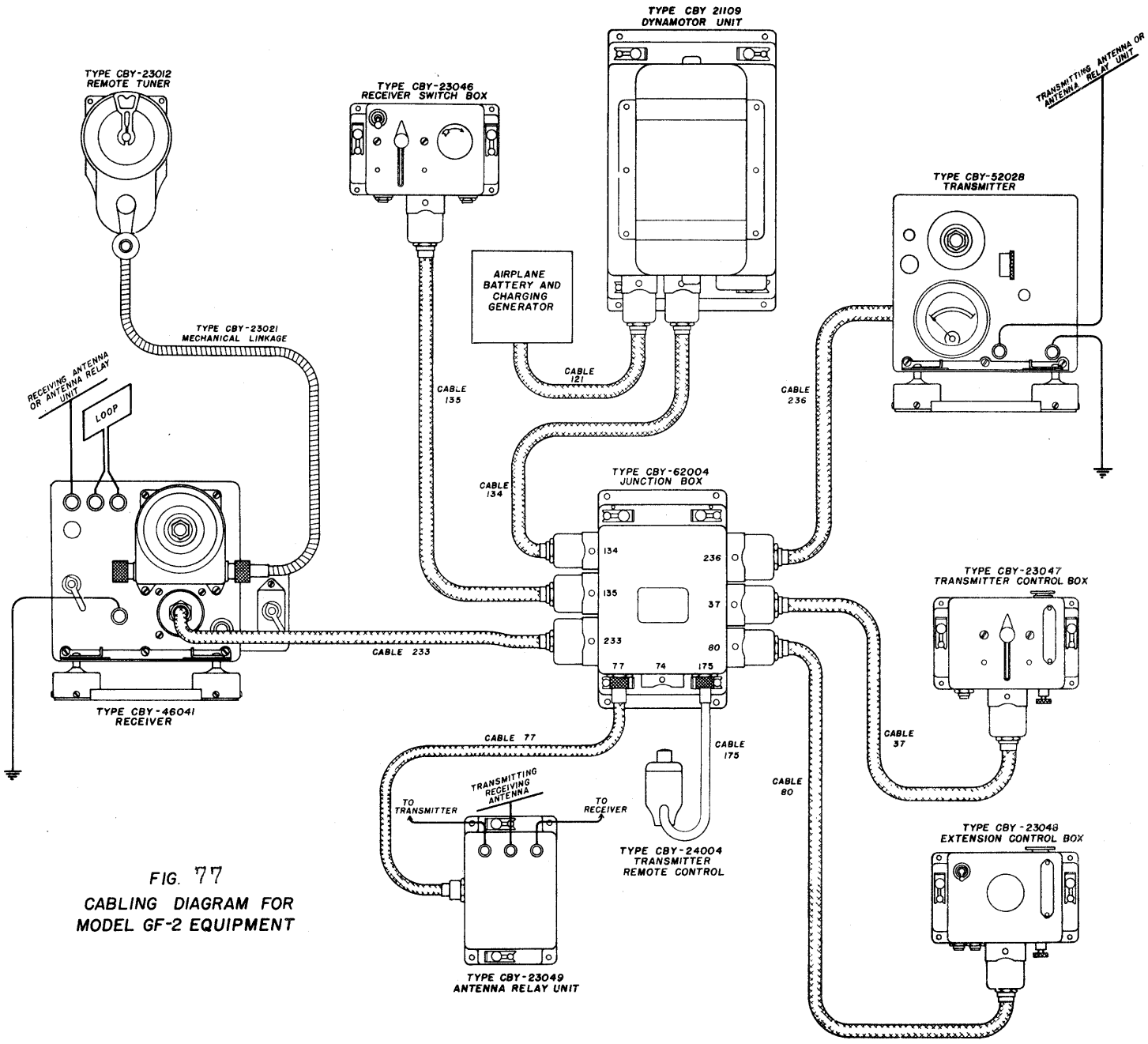


FIG. 77
CABLING DIAGRAM FOR
MODEL GF-2 EQUIPMENT

FIG. 78 SCHEMATIC CIRCUIT DIAGRAM, MODEL GF-2 EQUIPMENT

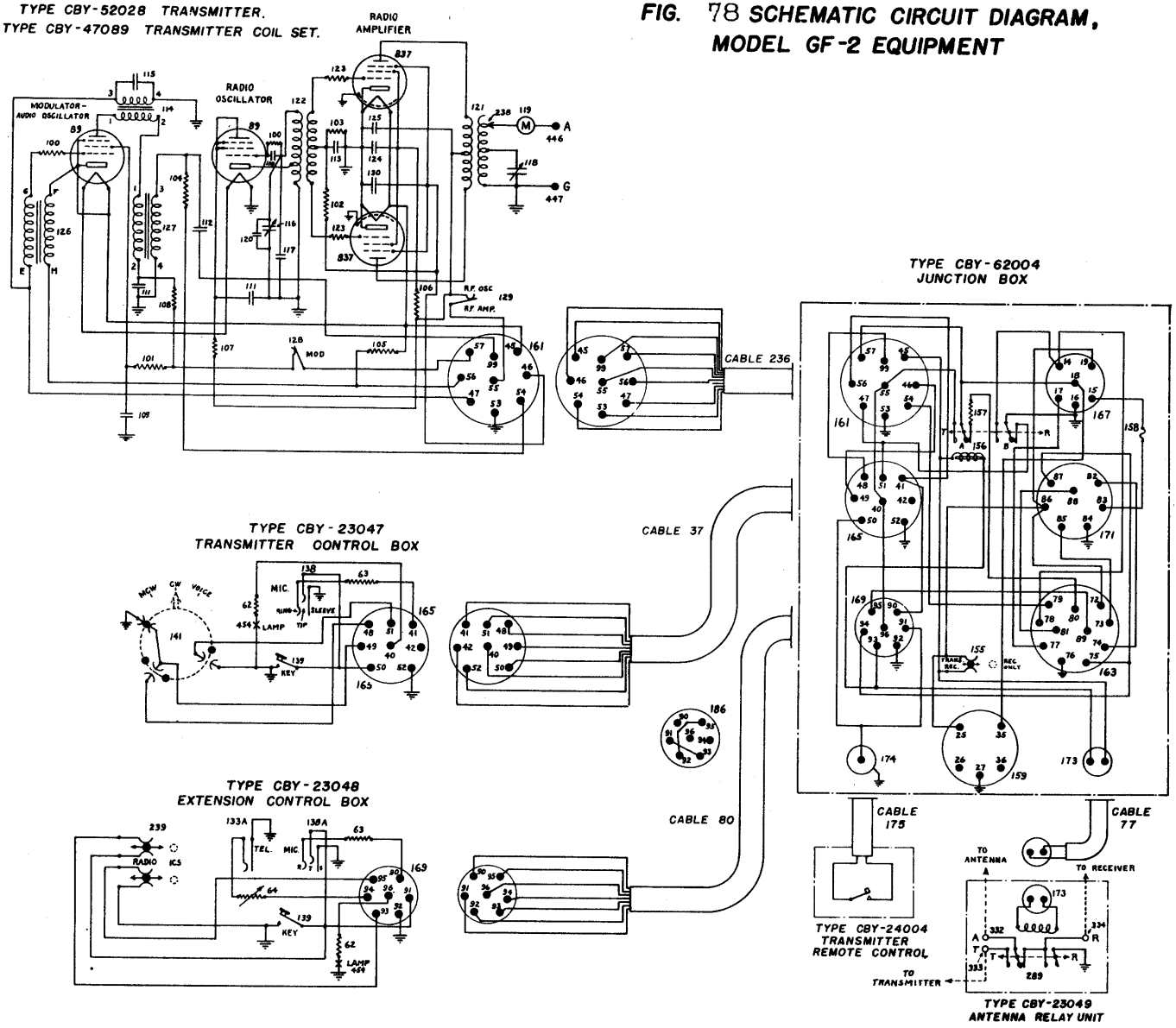
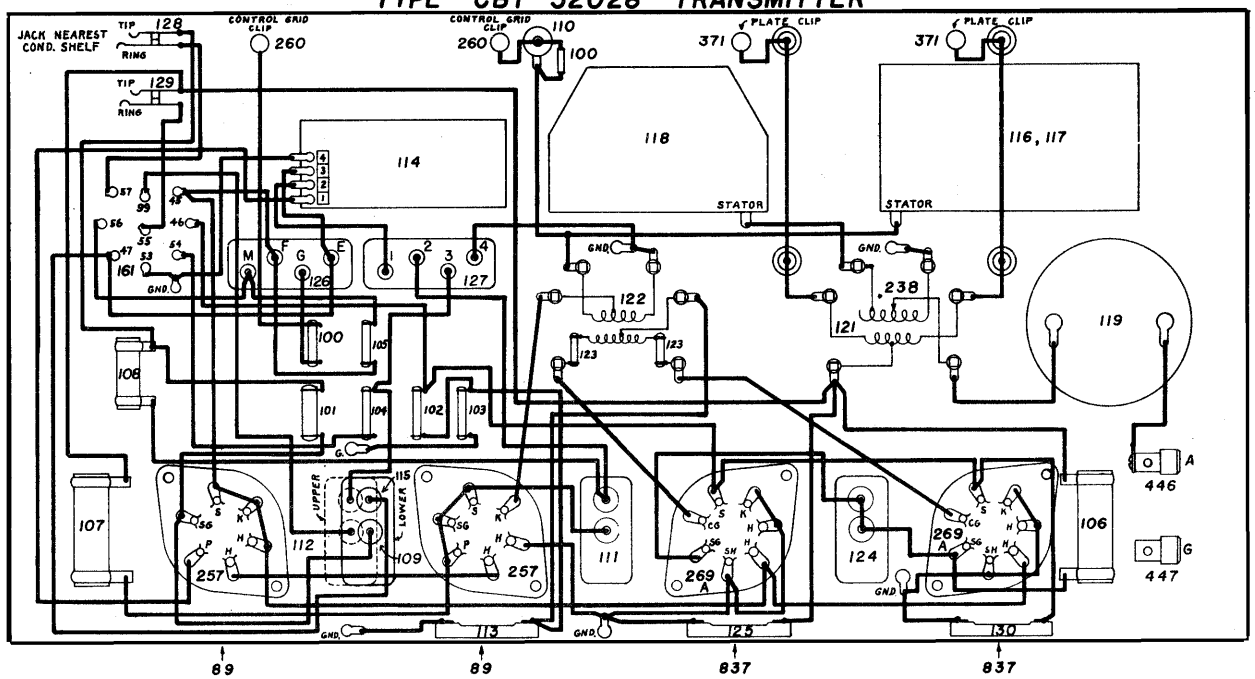
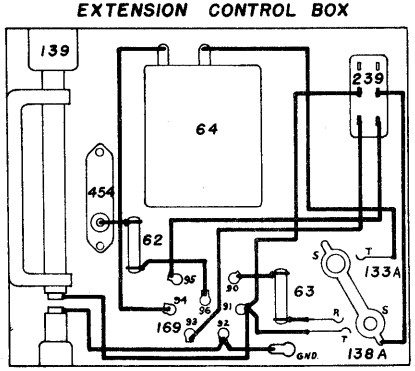


FIG. 79 WIRING DIAGRAM, UNITS OF MODEL GF-2 TRANSMITTER EQUIPMENT

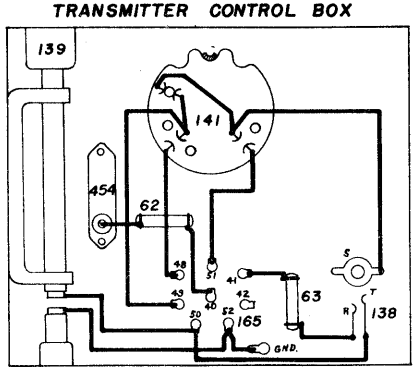
TYPE CBY-52028 TRANSMITTER



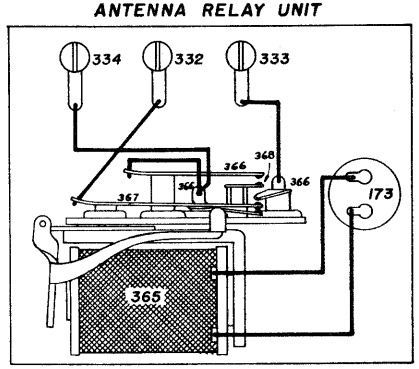
TYPE CBY-23048 EXTENSION CONTROL BOX



TYPE CBY-23047 TRANSMITTER CONTROL BOX



TYPE CBY-23049 ANTENNA RELAY UNIT



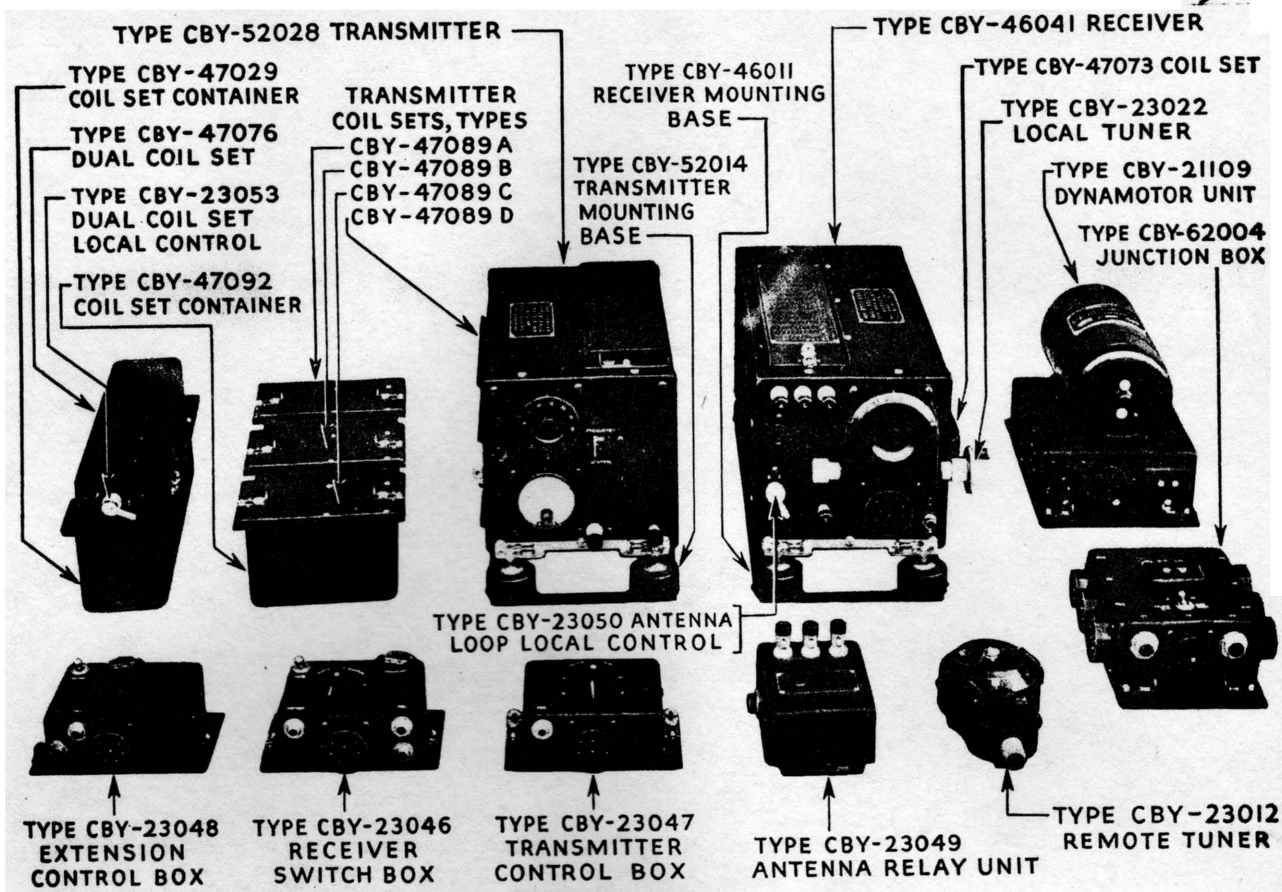


FIG. 80—PRINCIPAL UNITS, MODEL RU-3A AND MODEL GF-2 EQUIPMENT

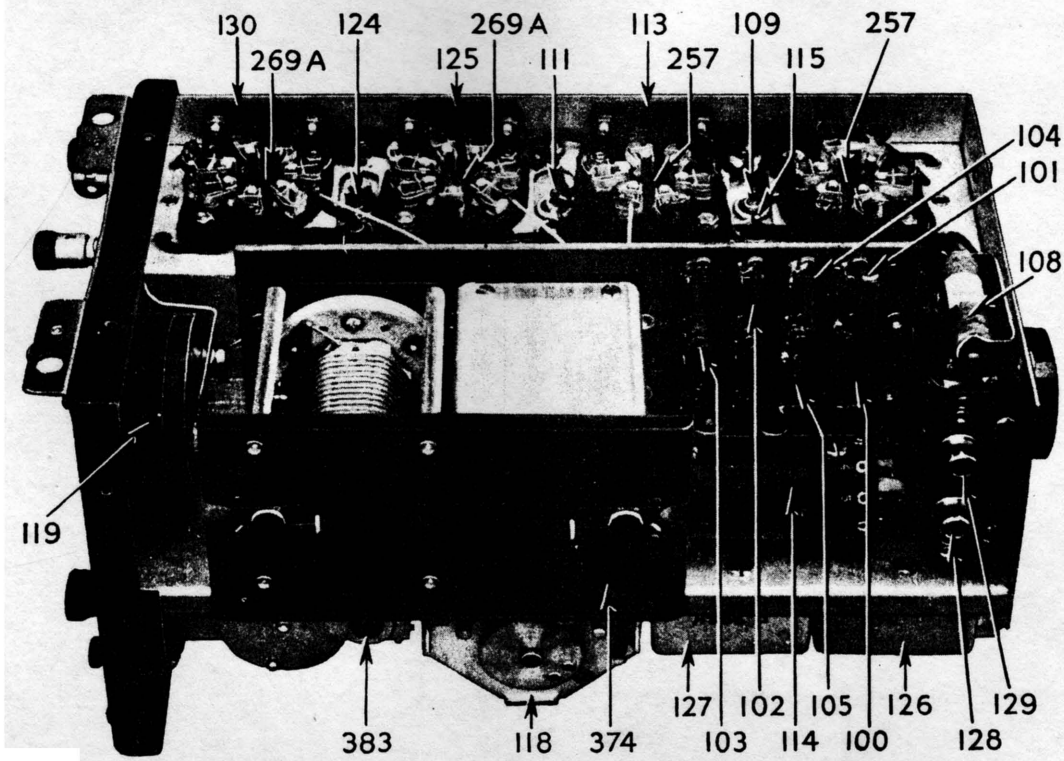


FIG. 81—TYPE CBY-52028 TRANSMITTER, BOTTOM VIEW