AIRCRAFT RADIO

CHAPTER VII

AIRCRAFT TRANSMITTERS

75. GENERAL

The GO series transmitters are the present standard type for patrol aircraft. They are double, all-wave transmitters, high and intermediate, with quick switch-over from a common rectifier.

The GP series transmitters are the present standard type for two-seater scout and observation airplanes and miscellaneous airplanes. They are of the plug-in coil type with six coil ranges covering the band 350 to 9050 kcs. Interphone is provided as part of the GP series transmitter equipment.

The GN transmitter is a semi-experimental type, an all-wave transmitter, high and intermediate frequency, with quick switch over from a common rectifier, of the same general shape as the GP transmitter.

The GF-1 transmitter is very similar to the GF. The GF-2 and GF-3 transmitters are standard for single-seat planes, two seat dive bombers, and patrol airplanes inter-squadron work. The GF series transmitters are dynamotor operated from a 12 volt direct current airplane power supply; all others listed above are operated from rectifiers in the radio set which convert 800 cycle alternating current airplane generator supply into filament and plate power. All of the above transmitters are of the master oscillator, power-amplifier type, continuously variable.

For more complete information on any of these type transmitters see the following sections in this pamphlet devoted to individual types.

76. MODEL GF-1 TRANSMITTER EQUIPMENT

GENERAL

Model GF-1 Transmitter Equipment consists of a radio transmitter with associated cables and control units. It does not include the Junction Box and power supply necessary to make an independently operated radio transmitting equipment, since the various units of Model GF-1 Transmitter Equipment are designed for operation in conjunction with Model RU-3 Receiving Equipment. When connected with Model RU-3 Equipment as described below, the combination forms a complete Model GF-1 Equipment. The Transmitter Equipment is adapted for installation and operation in aircraft of all types. It may be used to transmit voice modulated, tone modulated, and unmodulated signals in the frequency range 6200-7700 kilocycles. Model GF-1 Transmitter Equipment consists

of the following units which may be identified by reference to the various figures in this instruction book.

(1) Type CBY-52027 Transmitter.
(2) Type CBY-52014 Transmitter Mounting Base. *
(3) Type CBY-47064 Transmitter Coil Set.
(4) Type CBY-23045 Transmitter Control Box.
(5) Type CBY-24004 Transmitter Remote Control.
(6) Type CBY-23049 Antenna Relay Unit.
(7) One each of Cables 136, 37*, 175, 77.
(8) Three Type CRP-38110-A Vacuum Tubes.*
(9) One Type CRP-38142 Vacuum Tube.*

* No units of Model GF-1 except these are interchangeable in Model GF-1 and Model GF Equipment.

The reference numbers used in the following discussion refer to parts numbered in the various drawings accompanying this section.

Fig. 71 shows a cabling diagram for Model GF-1 Equipment. Fig. 72 shows a schematic circuit diagram of Model GF-1 Equipment while Fig. 73 shows a wiring diagram of the transmitter, transmitter control box and antenna relay unit. Fig. 74 shows a simplified schematic diagram of the GF-1 transmitter given to facilitate point to point resistance measurements and otherwise combine necessary data for rapid servicing of this equipment. Fig. 75 gives a diagram showing Socket voltage readings which will facilitate servicing.

VACUUM TUBES

Three Type CRP-38110 - A tubes are used in the Type CBY-52027 Transmitter: one as a radio-frequency oscillator, one as a radio-frequency amplifier, and one as an audio frequency tone oscillator. This tube is a triode comprising a directly heated filament, a control grid and a plate. It is designed primarily for use as an oscillator and amplifier and is characterized by a relatively low amplification factor and internal plate resistance. The filament is oxide-coated. The base of the tube is a ceramic material (Isolantite) having a low dielectric constant and low dielectric losses at radio frequencies.

One type CRP-38142 tube is used in the Transmitter as an audio amplifier and modulator. This tube is a triode having a directly heated filament, a control grid and a plate. It is designed primarily for use as an audio power amplifier and is characterized by a lower amplification factor and plate resistance than the CRP-38110-A. The filament is oxide-coated and the tube base is bakelite.

The following table gives the significant constants of these tubes within their operating range in the transmitter:

	Type CRP-38110-A	Type CRP-38142
Filament Voltage	7.0 v.	7.0 v.
Filament Current	1.2 a.	1.2 a.

	Type CRP-38110-A	Type CRP-38142
Grid Voltage	-7.0 v.	-40.0 v.
Plate Voltage	220.0 v.	220.0 v.
Plate Current	-.025 a.	.028 a.
Amplification Factor	6	3.6
Plate Resistance	6000 ohms.	1800 ohms.

TRANSMITTER

The Type CBY-5207 Transmitter consists of a set-box including the circuits and tuning elements required for the generation, amplification and modulation of radio currents, including the supply and coupling terminals, tube sockets, power terminals and plug-in coil terminals.

The transmitter case is a riveted aluminum case having an opening in one end for the power plug and the other end entirely open. It has an opening in one side for the Coil Set and a second opening in the top, closed by a tube cover. The open end of the case is closed by a metal panel on which are mounted the antenna and ground binding posts 46, 47, frequency control knob, dial, antenna condenser knob, locking knobs and antenna current ammeter 129. The internal frame or chassis of the Transmitter is permanently attached to a panel. The case is attached to this panel and various other points of the chassis and forms, together with the panel, a complete shielding closure for the Transmitter. The tube cover is attached to the case by two snap-slides.

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, a modulator stage for amplifying either internal or external modulation currents and modulating the radio frequency amplifier therewith, and a tone oscillator for generating modulating currents used in tone telegraphy. The radio oscillator, radio amplifier, and audio oscillator are type CRP-38110-A tubes. The modulator is a type CRP-38142 tube.

The radio oscillator circuit comprises a shielded coil assembly 122, variably tuned by a condenser 116, which is operated by the frequency control knob and carries a dial. This control knob drives the condenser shaft through a worm gear. 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 117 is a fixed air condenser connected in shunt with 116 and mounted in the same frame. Condenser 120 is a small variable air condenser also mounted in the same frame and adjustable with a screw-driver through an aperture under the compensating condenser 288. The function of this condenser is to compensate, by small changes in the fixed capacity of the oscillator circuit, for frequency changes introduced when the oscillator or amplifier tubes are changed. The oscillator has a grid resistor 105 and a grid condenser 114, the latter being mounted under the coil

panel. The oscillator is coupled to the grid of the amplifier by condenser 115, also mounted under this panel. The condenser 115 is connected to the coil assembly 122 through a fifth contact on the coil base. Condenser 119 is a leaf type mica condenser used for balancing out the grid-plate capacity of the amplifier tube. Grid bias for the amplifier is provided by returning this grid through choke coil 126 to terminal 68 of the plug receptacle. The amplifier plate feeds shielded coil assembly 121, which is a part of the Type CBY-47064 Coil Set. In parallel with a portion of this coil assembly 121, is the variable condenser 118, which may be adjusted by a knob. The capacity of this condenser decreases in the direction of the arrow engraved on the knob. The antenna binding post is also connected to this secondary coil through ammeter 129 by the adjustable tap arm 130. 110 is a by-pass condenser. The plate circuit of the radio amplifier tube is connected through jack 128 to terminal 64. When terminal 64 is connected externally to terminal 63, this amplifier plate circuit is connected through the secondary SK, of the modulation transformer 124, to a high-voltage terminal, 70, of the power plug receptacle. This terminal 70 also supplies high voltage through jack 127 to the plate of the CRP-38142 modulator tube. The grid of the modulator tube is connected through the secondary GE of the modulation transformer 123 to terminal 67. Modulating currents through the primary MF of transformer 123 are impressed on the grid of the CRP-38142 tube, amplified, and impressed from its plate circuit through transformer 124 on the plate of the radio amplifier tube. The CRP-38110-A tone oscillator tube has an oscillation circuit comprising windings 1-2 and 3-4 of coil assembly 125 with fixed condenser 107. Resistor 100 and condenser 106 are grid resistor and grid condenser respectively. The plate of the tone oscillator tube is supplied with voltage, through the voltage drop resistor 101 by-passed by condenser 112, from terminal 71. Audio current from this oscillator is impressed through winding 5-6 of coil assembly 125 into the grid circuit of the modulator tube through winding MF of transformer 123. This winding is connected to the 12-15 volt terminal 62, which also feeds the series-parallel connected filaments of the radio oscillator and amplifier tubes. Modulating currents from an external source may be introduced through terminal 69 into the circuit including primary coil MF of the modulator grid transformer 123. Terminal 65 is coupled to the plate of the modulator tube, for the withdrawal of side-tone voltage, through two condensers 108 and one condenser 109, connected in parallel. Each of condensers 108 has a capacity of .006 mfd and condenser 109 has a capacity of .001 mfd. The block of three condensers in parallel has a total capacity of .013 mfd., which is included in the transmitter for use in the side-tone circuit when low-impedance and telephone receivers are employed with the equipment. For high impedance telephones the soldered jumper connection between points H and L must be removed, leaving the

single capacity 109, of .001 mfd., in the circuit. The combination of condensers 109 and 108 in the side-tone circuit gives approximately the same side-tone intensity on low-impedance telephones as condenser 109 alone on high-impedance telephones.

Note: When high-impedance telephones are used with this equipment, both receiver and transmitter must be connected for high-impedance telephones. When low-impedance telephones are used, both receiver and transmitter must be connected for low-impedance telephones. Never try to operate the radio set with the receiver connected for telephones of one type and the transmitter connected for telephones of the other type.

Terminal 66 is grounded. 127 is a closed-circuit jack to which access may be obtained through a snap cover at the rear end of the set-box for measuring the combined plate currents of the radio oscillator and modulator tubes. 128 is a similar jack for measuring the plate current of the radio amplifier tube. No means are provided for measuring the tone oscillator current.

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 snap-slide studs to which the transmitter is secured by four snap-slides on mounting brackets.

TRANSMITTER CONTROL BOX

Type CBY-23045 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 and a plug receptacle. This control box carries besides the telegraph key one manually operated control, the three-position switch 141, operated by a handle. Switch 141 selects the type of emission from the transmitter. It has a center position "CW", a side position "MCW" and a second side position "VOICE". Terminal 41 of the plug receptacle is wired to the ring contact 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 terminal 50 to the power relay 153 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 on 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.

ANTENNA RELAY UNIT

The type CBY-23049 Antenna Relay Unit is shown in Fig.

73, also in the various circuit and wiring diagrams and in the drawings. It is a disposable 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 153 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

The 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 shown in Fig. 72, and its use is indicated in the circuit diagram. It is connected into the circuit between terminal 50 of the Junction Box and ground, when cable 175 is plugged into receptacle 172.

CO-OPERATION OF UNITS

The units of Model GF-1 Transmitter Equipment do not constitute a complete self-contained transmitting equipment. These units are designed solely for operation in conjunction with Model RU-3 as herein described, provide a complete Model GF-1 Transmitting and Receiving Equipment. Consequently in this and succeeding sections of this pamphlet, the operation of the transmitter and associated units willbe described in connection with all units of an operative transmitting and receiving installation.

In an operating installation, when the various units of Model GF-1 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 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 44, through fuse 151 and terminal 83 in the Receiver Switch Box. When the Switch Box Switch 134 is in its "OFF" position, there is no voltage on the Dynamotor Unit, Transmitter or Receiver for all positions of all other controls.

High voltage from the Dynamotor Unit at terminal 18 may be impressed upon either the Receiver or the Transmitter (but not both at once), depending upon the position of the junction box relay 153. The coil of this relay is supplied with voltage from the 12-15 volt source through terminal 86 and switch 155, and the circuit is completed to ground independently through each of three 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 terminal 18 is led to the Transmitter. When this circuit is open, the relay armature drops back and the high voltage terminal 18 is connected to the receiver terminal 80; at the same time a second pair of relay terminals short-circuit jack 138. For remote switch control of this throw-over operation, Type CBY-24004 Transmitter remote control should be plugged into receptacle 172. When the switch button of this Remote Control is depressed, relay 153 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 jack 138 or by operating the telegraph key.

When relay 153 is in its "Receive" position (Remote Control Switch UP, Transmitter Control Box Key 139 UP, and microphone switch 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 Junction Box switch 155 is in its "REC-ONLY" position. The receiver is then tuned and controlled exactly as described in detail for Model RU-3 Equipment in section IV of this pamphlet.

When relay 153 is in its "Transmit" position the high voltage terminal of the Dynamotor Unit is connected through this relay and the filter choke 144 to terminal 70 of the transmitter which supplies plate voltage to the radio oscillator, radio amplifier, and modulator tubes. At the same time, the ground connection is removed, at relay 153, from terminal 69 to the transmitter. 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 62 supplies 12-15 volts to the series-parallel filaments of the transmitting tubes. At all three positions of switch 141 high voltage is supplied to the plate circuits of the radio oscillator, radio amplifier, and modulator tubes. At the "MCW" and "CW" positions, terminal 71 of the plate circuit of the tone oscillator tube is connected through terminal 40 and switch 141, to terminal 70. Thus the tone oscillator operates in these two

positions but not in the "VOICE" position of the switch. In the "MCW" position the secondary SK of the modulation transformer 125 is connected from terminal 7o, through 63, 48, switch 141, 49 and 64, to the plate circuit of the radio amplifier tube. Since the tone oscillator operates in this position and feeds the grid circuit of the modulator tube, the audio oscillation from this oscillator thus modulates the output of the radio amplifier in "MCW" position. But in the "CW" position of switch 141, the secondary terminal S of Modulation transformer 123 is disconnected at switch 141 from the plate supply terminal, 64, of the radio amplifier, which is then connected through the switch and 51 directly to high voltage terminal 7o. Thus in the "CW" position of the switch no modulation voltage from the tone oscillator is impressed upon the radio amplifier and the output of the transmitter is unmodulated. The tone oscillator is left in operation at the "CW" position of the switch in order to provide side-tone during the transmission of CW signals. In both the "MCW" and "CW" positions the ring contact of the microphone jack 138 is permanently grounded at the switch 141. In the "VOICE" position of this switch the ground is removed from the ring contact of this jack, and the secondary SK of the modulation transformer 124 is again connected , through 63, 48, the switch, 49 and 64, to the plate circuit of the radio amplifier. Thus in the "VOICE" position, and modulating voltage impressed between the ring contact of jack 138, and ground, operates through 41, 69, and the primary MF of microphone transformer 123; it is amplified by the modulator tube and impressed through the modulation transformer 124 upon the radio amplifier tube to modulate its output. Resistor 143 in the Junction Box is connected in series with the microphone circuit from the jack 138 to the Transmitter, merely for the purpose of limiting the direct current in this line supplied through the 12-15 volt terminal 62. Since the high voltage is removed by switch 141 from the plate supply terminal 71 of the tone oscillator tube in the "VOICE" position, this tube does not operate in this position of the switch.

Either a two-way or a three-way microphone plug may be used at jack 138 on the Transmitter Control Box. If a two-way microphone plug and cable are used, the throwover operation between receive and transmit cannot be performed at the microphone. But if the microphone is provided with a switch of the conventional type, which connects and disconnects a third wire in the microphone cable to and from the microphone return line, the three conductors of this microphone cable must be connected to the respective plug contacts as follows:Microphone to Ring of plug; Microphone switch line to Tip of plug. With a switch type microphone so connected, opening and closing the switch serves to disconnect and connect terminal 5o from ground and thus throws the send-receive relays between their two operating positions.

An audio "side-tone" current flows through condensers 108, 109, terminals 65 and 87, to the telephone receiver jack 133 in the Receiver Switch Box at all times. In the "VOICE" position on the Transmitter control Box this side-tone in the telephone receivers consists of currents having the same frequency as the voltage impressed at the microphone jack 138. In both the "CW" and "MCW" positions the side-tone is the 1000-cycle note of the tone oscillator although this "tone" modulates the transmitter only in the "MCW" position.

The coil of the Type CBY-23049 Antenna Relay Unit is connected into the Junction Box through cable 77. This coil is connected in parallel with the coil of the power relay 153. Thus when the power relay 153 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 three 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 key on the CBY-23045 Transmitter Control Box.
(3) Switch on the microphone plugged into the Transmitter Control Box.

Thus the Transmitter may be "keyed" for code transmissions, at all positions of the Transmitter Control Box Switch, by any one of these three throwover controls. Or, alternatively, the telegraph key on the Transmitter Control Box, may be used to switch from "Receive" to "Transmit" for voice transmissions, in cases where neither a Transmitter Remote Control nor a microphone switch are provided.

Model GF-1 Equipment is set for receiving, at all positions of the switch on the Transmitter Control Box, except when either the Transmitter Remote Control switch, the Transmitter Control Box key, or the microphone switch, is closed.

TRANSMITTER ANTENNAS

Model GF-1 Equipment may be operated with separate receiving and transmitting antennas, or with a single antenna. If separate antennas are employed, the Type CBY-23049 Antenna Relay Unit has no function, and need not be installed or connected through cable 77 to the junction box.

TRANSMITTER OPERATING TEST

The transmitter must be tuned and tested after installation. The following instructions on tuning apply also to normal service use. The transmitter should be tuned over dry soil; if circumstances render it necessary to tune the transmitter with the aircraft on a wet surface the antenna tuning should be re-adjusted, if possible, after the aircraft is in the air. The transmitter cannot be properly tuned inside a hangar. Three controls must be adjusted for any given frequency: (1) the frequency control; (2) the antenna coupling tap, adjusted by tap arm 130; (3) the antenna tuning condenser. First, set the frequency control (which operates the variable condenser of the radio oscillator) at the desired transmission frequency by comparison with the Chart, mounted on the CBY-47064 coil set, using interpolation if necessary. Second, set tap arm 130 on a turn of the antenna coupling coil which is appropriate for the frequency to be used. Care should be taken in adjusting this tap arm not to leave it between adjacent turns of the coil. This will short circuit these turns and render it impossible to tune the transmitter. Third, adjust the antenna condenser knob until the ammeter 129 gives a maximum current reading, with the transmitter control box switch at voice. The operator should familiarize himself by practice with the setting of the antenna coil tap and condenser for all frequencies within the operating range, using a given antenna. In general, antenna resonance at any given frequency may be obtained on the knob at one or two or three positions of the tap 130. But only one position of this tap will give an absolute maximum of current and power output, because the proper setting of this tap is determined by two factors. A value of coupling inductance must be provided which will (a) allow the antenna circuit to be resonated with the radio oscillator frequency by means of the antenna condenser; (b) furnish a suitable high impedance load for the radio amplifier tube to allow efficient power transfer. Increasing frequency always requires fewer number of turns in the antenna coil, between tap 130 and the ground end of the coil. With most antennas the tap giving maximum power output is, for the lower half of the frequency range, the highest tap on the coil (greatest number of turns) at which resonance can still be obtained by rotating the antenna condenser knob. In other words maximum power output is usually obtained with the coil so tapped that the antenna is resonated with its condenser 118 at or near its minimum capacity position. (decreasing capacity by turning knob to right) At the higher frequencies, where the antenna resistance is higher, maximum power (current) output will be obtained on taps requiring the use of more capacity. When the transmitter is first placed in service it should be tuned to a frequency near the low end of the band (at about 500 scale divisions). In this frequency region the maximum power

output will be obtained with the antenna tap at or near the high end of the coil, on the twelfth or thirteenth turn, counting from the end which engages the pin plugs. The antenna current at resonance in this region should be about 0.7 ampere at 12 volts when the aircraft is on the ground, increasing to about 0.8 ampere at 14 volts on the ground. If the current is less than 0.5 ampere at the low frequency end of the scale, on the 12 volts supply, either the antenna design or the antenna insulation is faulty. Change to higher frequencies by increasing the scale divisions indicated by dial and re-adjust both the coil tap and the antenna condenser as needed, at each frequency for maximum output. The following table will serve as a general guide for this. After the coil tap is once set for a given frequency, the transmitter frequency may usually be altered by about 200 Kc on each side of the initial frequency and the antenna retuned by varying the setting of the knob, without changing the coil tap.

NOTE: It is important that the transmitter be always operated with the antenna circuit tuned to resonance. If it is operated with the antenna circuit off resonance, excessive current will be drawn from the dynamotor unit and poor modulation as well as low power output, may result. The transmitter controls may be locked in position by means of lock screws.

When the receiver is to be used for a considerable period without using the transmitter, the toggle switch 155 on the junction box should be thrown to "REC ONLY" position.

WARNING: Model GF-1 equipment will not operate if the supply voltage falls below 11 volts.

TRANSMITTER FREQUENCY CALIBRATION

A transmitter frequency calibration chart is mounted on the back of the transmitter coil set, Type CBY-47064. This chart gives the proper setting of the frequency control dial (radio oscillator tuning) for each 100 Kc between 6200 and 7700 Kc. Frequencies between the calibration points can be obtained with considerable accuracy by interpolation, assuming that the frequencies between each calibration point increases in proportion to the dial reading. The calibration chart on the transmitter coil set is good only for the transmitter whose serial number is engraved on that coil set. All these calibrations are made for one setting of the compensating condenser 120 in the transmitter radio oscillator circuit. This condenser should never be touched or altered unless tubes are changed in the transmitter. Each time that either the radio oscillator tube (CRP-38110-A) or the radio amplifier tube (CRP-38110-A) or both are replaced by new tubes the entire calibration of the transmitter will be shifted slightly either up or down. Condenser 120 is provided to allow the use of the old calibration chart without loss of accuracy after the original tubes are replaced by new ones.

But in order to take advantage of this possibility of compensating the oscillator circuit for changes in tubes, a separate standard frequency (such as may be obtained from a crystal frequency indicator) somewhere in the band 6200-7700 KC will be required. Access to the shaft of the compensating condenser 120 may be obtained through the cover in the Transmitter Case. The process of compensating for changes in tubes should be carried out as follows. Set the standard frequency source on some even frequency between 6200 and 7700 KC. Listen in on an independent receiving circuit (or on the standard frequency source if provision is made there for the use of telephones). Set the frequency control of the Transmitter exactly on the dial reading which is given for this frequency on the Transmitter Calibration Chart. Tune the output circuit of the transmitter to resonance, as indicated by a maximum current reading on ammeter 129. (A transmitting antenna or Type CBY-66000 Phantom Antenna must be connected to the transmitter throughout this operation.) Insert a screw-driver in the slotted shaft of condenser 120 which is back of the slide cover in the side of the Transmitter case. Rotate this shaft slowly to right or left until zero beat is heard between the radio-frequency output of the Transmitter and the radio output of the standard (known frequency) oscillator. When this adjustment has been properly made the calibration chart supplied for this particular Coil set and Transmitter may then be used for setting the Transmitter to any other predetermined frequency within the operating range, using the vacuum tubes with which the adjustment just described has been made. Note: Unless a frequency standard having an accuracy of at least 0.05% is available for use in making this adjustment of the compensating condenser for new tubes, the compensating condenser should be left alone, and the calibration chart supplied with the Transmitter should be used even after tubes are changed.

Changing the type CRP-38142 modulator tube or the Type CRP-39110-A tone oscillator tube has no effect on the frequency calibration of the Transmitter.

FREQUENCY	ANTENNA COIL TAP	MODULATOR, OSCILLATOR PLATE CURRENT 12 V.	14 V.	AMPLIFIER PLATE CURRENT 12 V.	14 V.	ANTENNA CURRENT 12 V.	14 V.
6200	16	.052 A.	.060 A.	.018 A.	.022 A.	.60 A.	.77 A.
6500	14	.052	.058	.018	.025	.65	.80
6800	13	.052	.060	.018	.022	.66	.78
7100	11	.052	.061	.018	.023	.63	.78
7400	10	.050	.058	.019	.023	.65	.82
7700	9	.047	.055	.022	.025	.65	.82

The figures in the ANTENNA COIL TAP column represent the number of turns on the antenna coil between the tap arm 130 and the base of the coil, for maximum power output, adjusting knob for the final resonance point in each case. Make sure that the tap arm 130 makes contact with a single turn only and does not short circuit two adjacent turns.

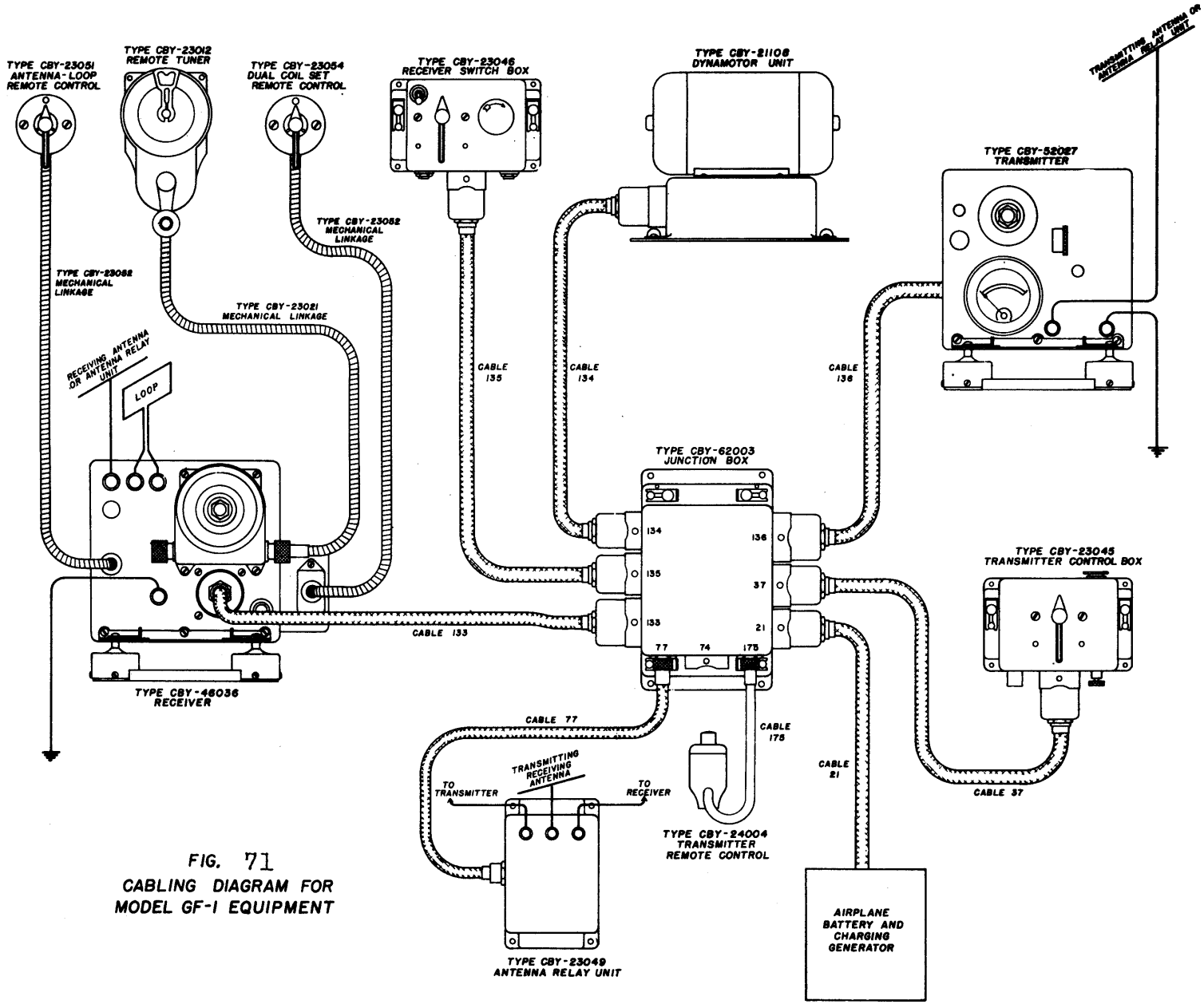


FIG. 71
CABLING DIAGRAM FOR
MODEL GF-1 EQUIPMENT

FIG. 7.2 SCHEMATIC CIRCUIT DIAGRAM, MODEL GF-1 EQUIPMENT

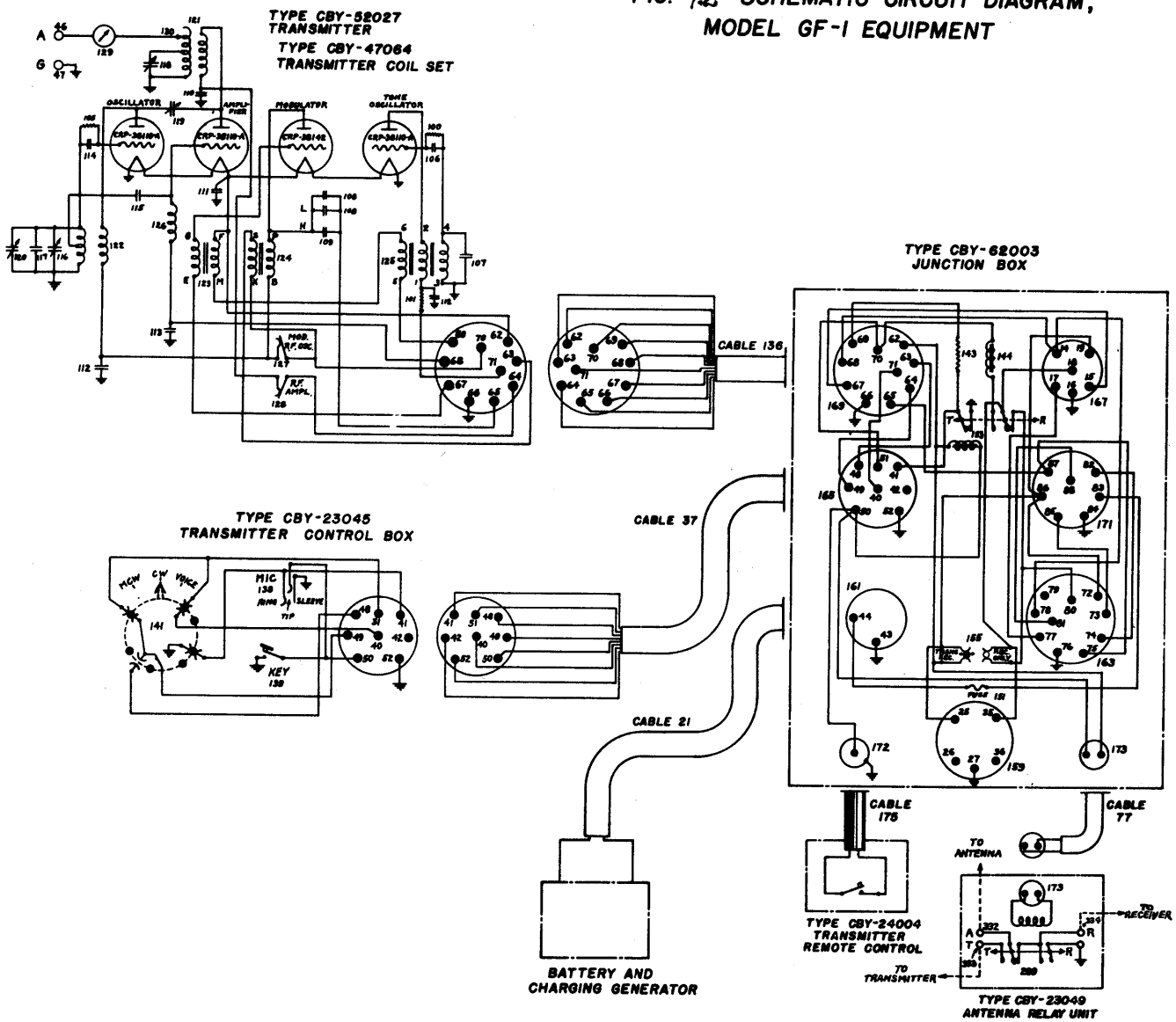
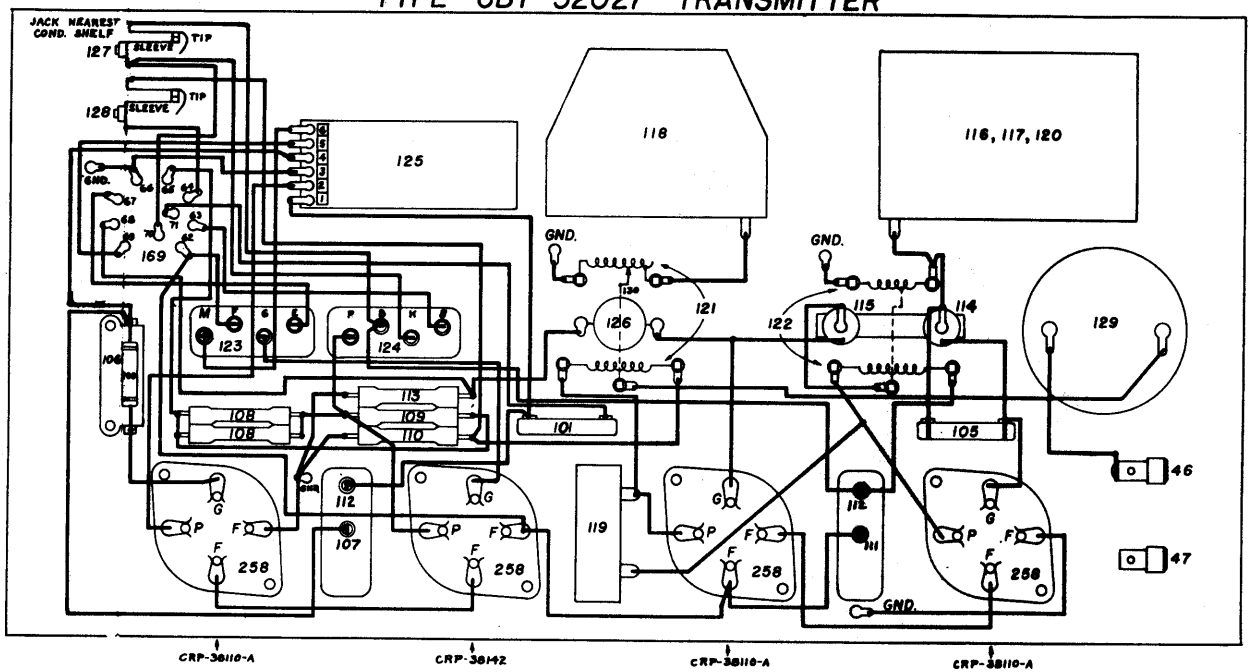
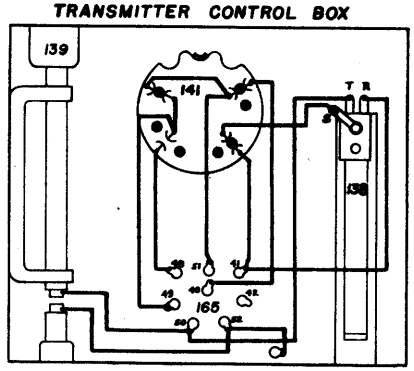


FIG. 73 WIRING DIAGRAM, UNITS OF MODEL GF-1 TRANSMITTER EQUIPMENT

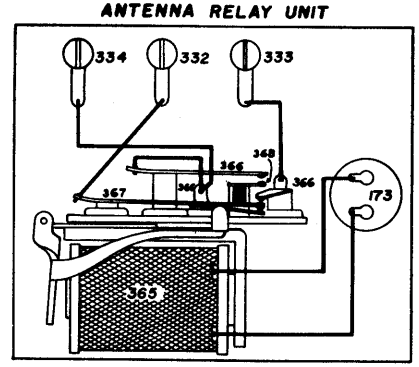
TYPE CBY-52027 TRANSMITTER



TYPE CBY-23045 TRANSMITTER CONTROL BOX



TYPE CBY-23049 ANTENNA RELAY UNIT



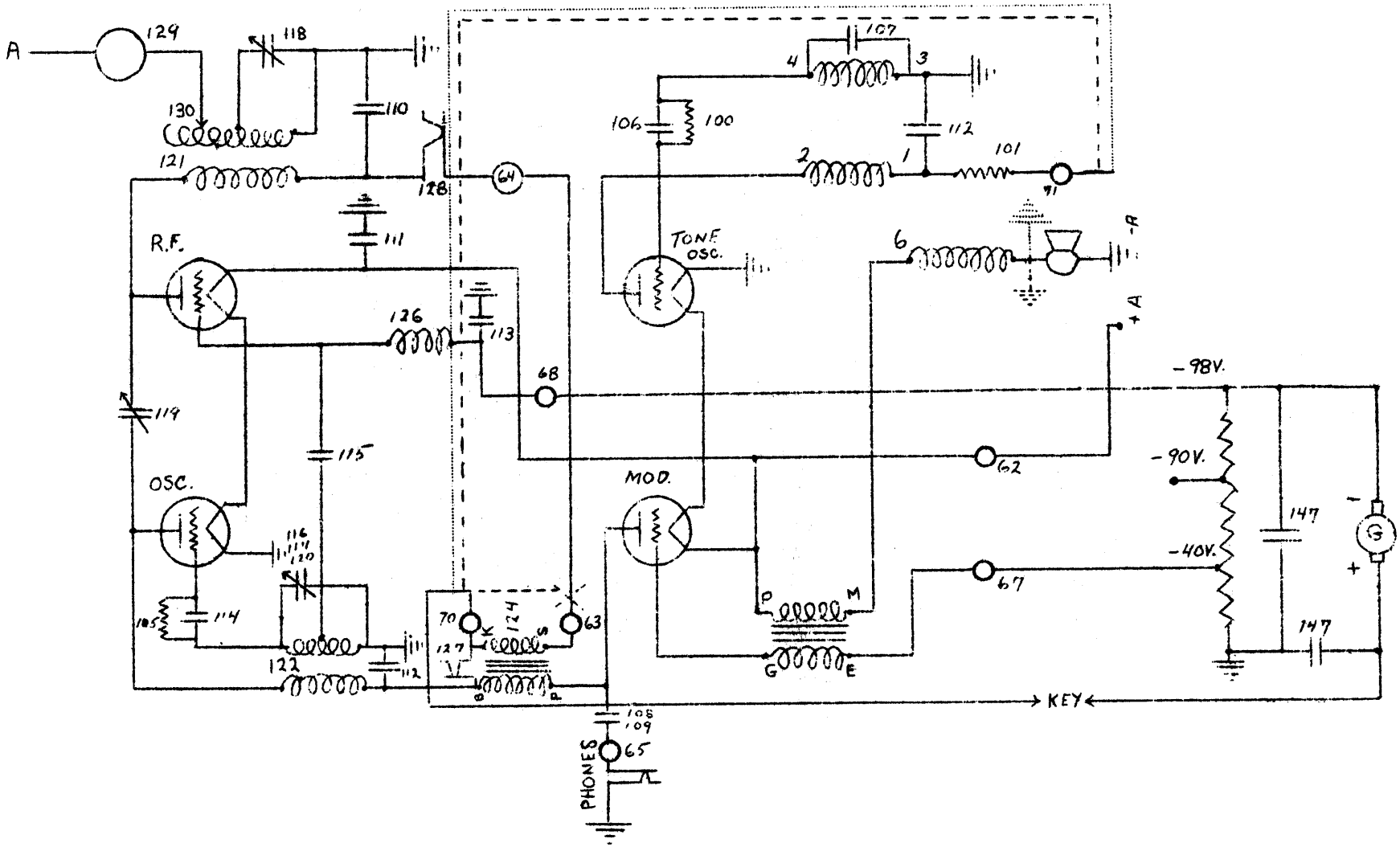
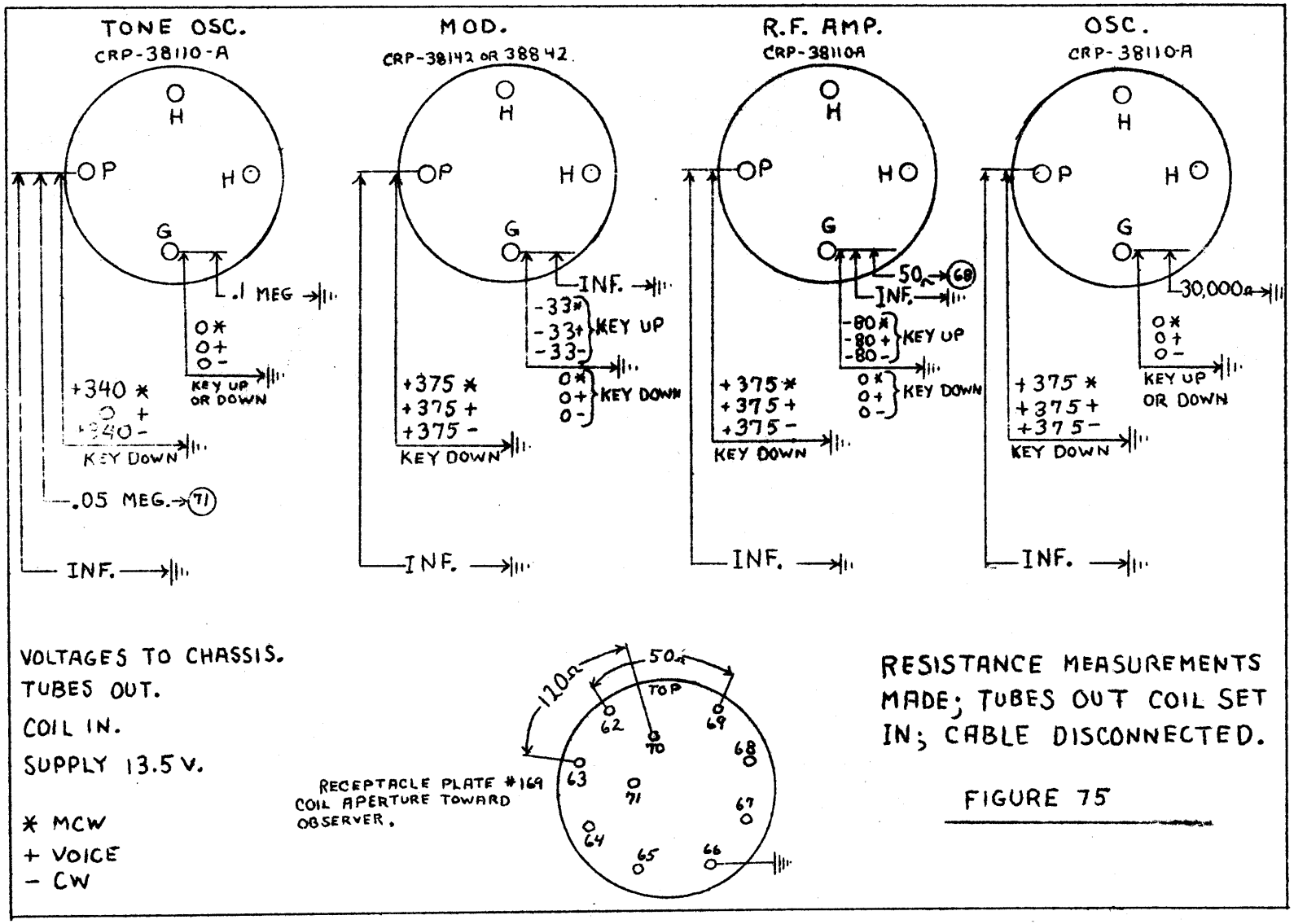


FIGURE 74.
SIMPLIFIED SCHEMATIC DIAGRAM
OF GF-1 TRANSMITTER

TRANSMITTER CBY-52027.



VOLTAGES TO CHASSIS.
TUBES OUT.
COIL IN.
SUPPLY 13.5 V.

* MCW
\+ VOICE
\- CW

RECEPTACLE PLATE #169
COIL APERTURE TOWARD OBSERVER.

RESISTANCE MEASUREMENTS MADE; TUBES OUT COIL SET IN; CABLE DISCONNECTED.

FIGURE 75

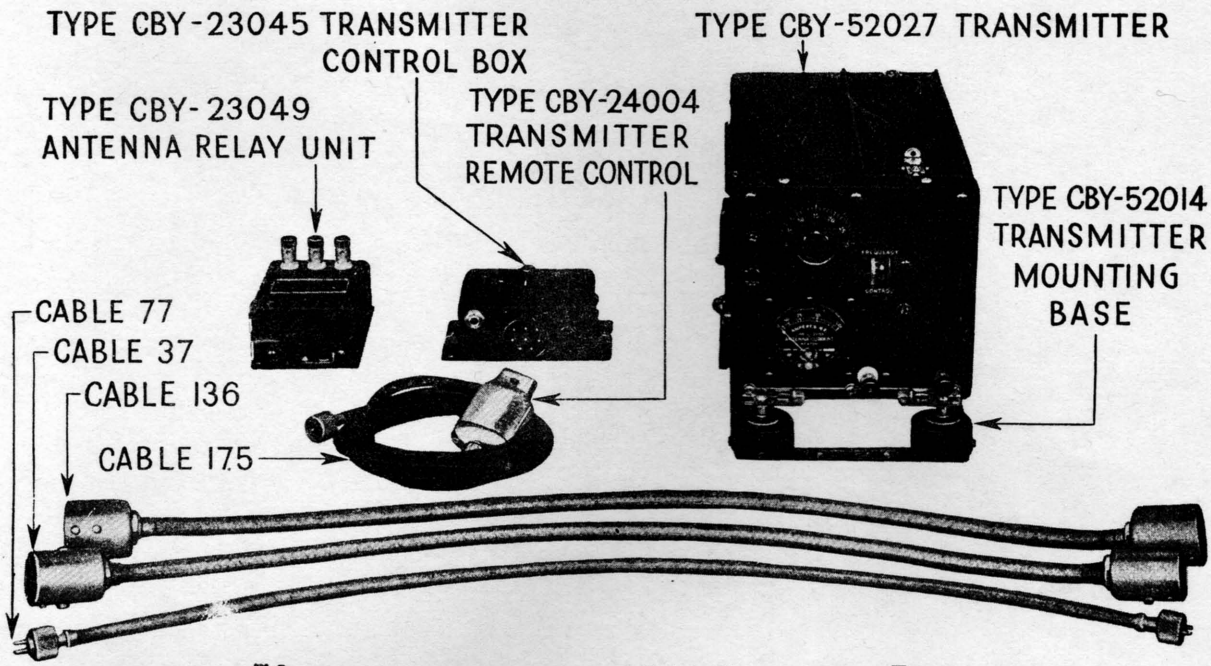


FIG. 76 -PRINCIPAL UNITS, MODEL GF-1 TRANSMITTER EQUIPMENT

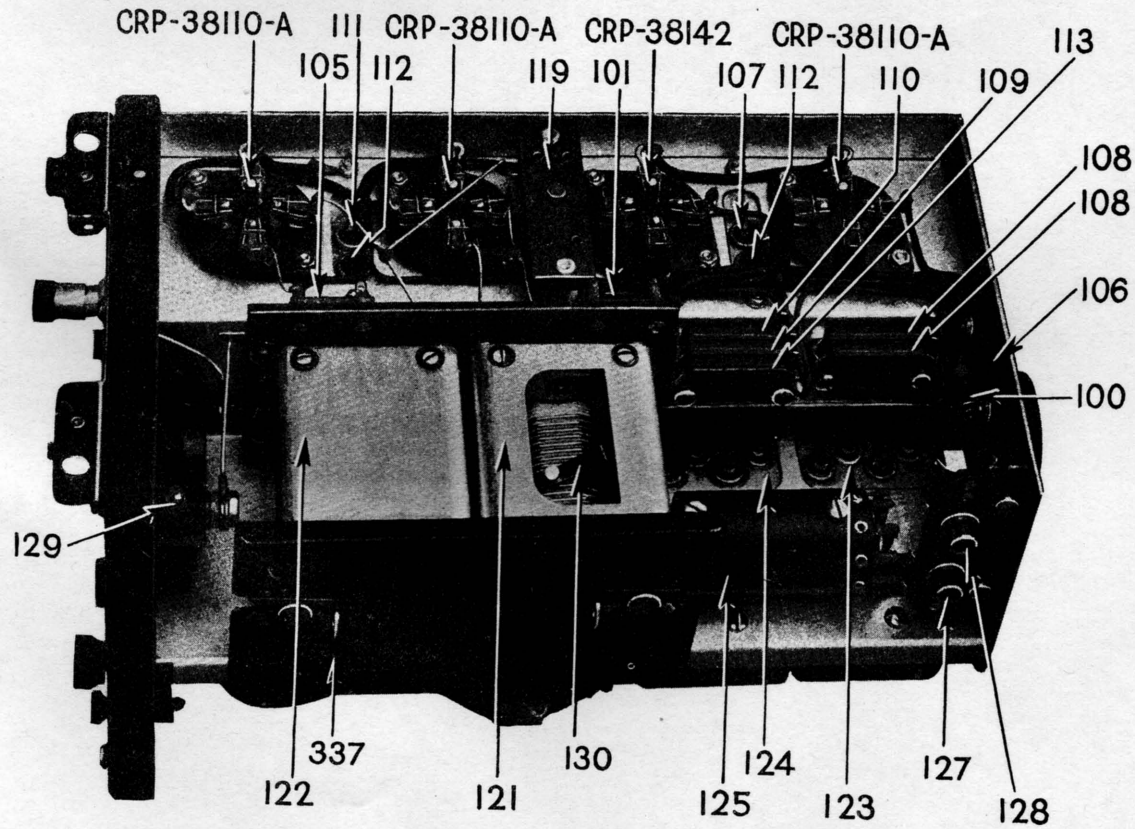


FIG 76A -TYPE CBY-52027 TRANSMITTER, BOTTOM VIEW