

be connected to the airplane's telephone system and its level controlled by an external potentiometer, normally installed for pilot control. An expansion circuit effectively narrows the cone of reception over a marker and gives sharp definition to its edges. When not over a marker, this circuit acts to squelch the receiver output.

1-29. DESCRIPTION OF RADIO TRANSMITTERS.

1-30. RADIO TRANSMITTERS ARC TYPE T-11A AND T-11B. (See figure 1-2.)

Note

Radio Transmitter ARC Type T-11B supercedes Radio Transmitter ARC Type T-11A. Functionally, the T-11A and T-11B transmitters are identical. Electrically, differences occur in that of electron tubes used, certain detail part values, and the sidetone circuit. The numerical series of 201-299 for reference designations has been assigned to the T-11A and that of 2301-2399 to the T-11B. The following discussion refers to the detail parts of the T-11B; but, unless otherwise noted, the information supplied is also applicable to the T-11A, requiring only the substitution of the corresponding 200-series number to obtain the T-11A reference symbol. For example: For L2302, read L202 for the T-11A transmitter.

Radio Transmitter ARC Type T-11B is a four-tube, five-channel, crystal-controlled, voice amplitude-modulated transmitter, designed to permit the transmission of voice signals from aircraft to ground in any 2-megacycle band located between 116-132 megacycles. Because of the narrow band, only one set of tuned circuits is required. Four type 6AQ5 electron tubes in the T-11A, and four type 5763 electron tubes in the T-11B, are used for the crystal oscillator-doubler, amplifier-tripler, power amplifier-doubler, and modulator circuits.

1-31. The oscillator is a crystal-controlled Pierce oscillator designed to operate at $1/12$ or $1/18$ of the output frequency. Depending on the crystal used, the oscillator of the T-11A and the T-11B can operate as a doubler or a tripler at the $1/12$ or $1/18$ fundamental, respectively. The output of V2301 is tripled in the plate circuit of V2302 and finally doubled in the plate circuit of V2303. V2304, the modulator, acts as an a-f amplifier which plate-modulates the power amplifier at better than 90 percent. The unmodulated carrier output power is better than 2 watts. The microphone feeds into a 1:10 step-up microphone transformer. The modulator tube V2304 feeds into a 1:1.5 step-up transformer which feeds the r-f power amplifier and modulates its output.

1-32. The T-11B transmitter is designed for remote-control frequency selection through the use of Control Unit ARC Type C-25, or similar component. Setting the selector switch of the control unit to the desired frequency operates a relay which in turn connects the proper crystal into the oscillator circuit. When the

selector switch is set to the INT position, where no crystal is installed, interphone communication is made possible through the use of a sidetone circuit. In the T-11A, this sidetone, to the headset line in the associated receiver, such as the R-15, is obtained from the plate of V204, through capacitor C201. The sidetone in the T-11B is obtained from the cathode of V2304, through capacitor C2318.

1-33. Neither the T-11A nor the T-11B contains a permanently connected meter. However, a built-in crystal detector (type 1N34, CR206 in the T-11A; type 1N34A or 1N82, CR2306 in the T-11B), with a-f bypassing is incorporated in the output circuit and provides a means of checking the tuning and modulation with an external d-c voltmeter.

1-34. An input of 1 ampere at 14 volts dc or 0.5 ampere at 28 volts dc is required for the heaters of the type 6AQ5 vacuum tubes. The requirements for the 5763 heaters are 1.5 amperes at 14 volts dc or 0.75 ampere at 28 volts dc. High voltage for the transmitter is obtained from the receiver dynamotor. The interconnections between the transmitter and receiver are arranged so that when the microphone switch is closed in preparation for transmission a single-pole double-throw relay (K2302) in the transmitter is actuated, switching the high voltage from the receiver to the transmitter. When two transmitters are installed, relays K2301 and K2302 of the transmitter not in use serve to patch the power and antenna input connections to the relays of the operating transmitter. The T-11A or the T-11B mounts on Mounting ARC Type M-11A and may be located at any convenient place in the airplane.

1-35. RADIO TRANSMITTERS ARC TYPE T-13 AND T-13A. (See figure 1-2.)

Note

Radio Transmitter ARC Type T-13A supercedes Radio Transmitter ARC Type T-13. Functionally, the T-13 and T-13A transmitters are identical. Electrically, differences occur in the type of electron tubes used, certain part values, and the sidetone circuit. The numerical series of 401-499 has been assigned to the T-13 and that of 2401-2499 to the T-13A. The following discussion refers to the detail parts of the T-13A, but, unless otherwise noted, the information supplied is also applicable to the T-13, requiring only the substitution of the corresponding 400-series number to obtain the T-13 reference symbols. For example: For L2402, read L402 for the T-13 transmitter.

Radio Transmitter ARC Type T-13A is a four-tube, five-channel, crystal-controlled, voice amplitude-modulated transmitter designed to permit the transmission of voice signals from aircraft to ground in any 2-megacycle band located between 132 and 148 mc. The frequency range can be shifted downward to cover 125-140 mc in the T-13A by the addition of a capacity plate, ARC-15900. In the T-13, a similar change can

be achieved using capacity plate ARC-15392. Each plate is equipped with sleeves of varying height which fit over the r-f tubes. The plate mounts on the modulation transformer and is secured by two studs, washers, and nuts. Four type 6AQ5 electron tubes in the T-13 and four type 5763 electron tubes in the T-13A are used for the crystal oscillator-doubler, amplifier-tripler, power amplifier-doubler, and modulator circuits.

1-36. The oscillator circuit consists of a crystal-controlled Pierce oscillator circuit designed to operate at 1/12 or 1/18 of the output frequency. Depending on the crystal used, the T-13A oscillator can operate as a doubler or tripler at the 1/12 or the 1/18 fundamental, respectively. The output of V2401 is tripled in the plate circuit of V2402 and finally doubled in the plate circuit of V2403.

1-37. High voltage for the T-13A is obtained from Dynamotor ARC Type D-10A mounted on the associated receiver of the system. Except for the frequency range covered, certain detail part values, and other differences noted in paragraphs 1-35 and 1-36, the T-13 transmitter is similar to the T-11A transmitter, and the T-13B to the T-11B. For further details refer to paragraphs 1-30 through 1-34.

1-38. UHF TRANSVERTER ARC TYPE TV-10. (See figure 1-2.) UHF Transverter ARC Type TV-10 is a combined uhf transmitter and a receiver converter. The transmitter portion functions as an independent transmitter on a frequency range of 228 to 258 mc; it does not require the use of any vhf component for transmission. The converter section converts received signals in the range of 228-258 mc to 118-148 mc, after mixing with a 110-mc crystal oscillator, and requires the use of an R-19 vhf receiver for reception. High voltage for all TV-10 circuits is supplied by the dynamotor mounted on the R-19 receiver.

1-39. The transmitter is a five-tube, eight-channel, crystal-controlled, voice amplitude-modulated circuit designed for aircraft-to-ground transmission in the frequency range of 228 to 258 mc. Four type 5763 and one type 6201 electron tubes are used. One of the 5763 tubes is used as a crystal oscillator-doubler, two as amplifier-doublers, and the remaining one as a modulator. The triode sections of the 6201 function as a push-pull amplifier-tripler. The eight transmitting channels may all be located in one 4-megacycle band or they may be divided between two bands, each 4 megacycles wide with at least a 2-megacycle separation. The power output is rated at 0.5 watt. At an altitude of 5000 feet, the transmitting distance range is approximately 60 miles. A type 1N82 crystal detector, with a-f bypassing, is used to provide a means of checking the tuning and modulation with an external d-c voltmeter.

1-40. The converter section of the TV-10 comprises a 228-258 mc uhf preselector, a 110-mc crystal oscillator using a type 6201 electron tube, a crystal diode

mixer, and a 118-148 mc vhf matching network. Incoming signals between 228 and 258 megacycles, after being mixed with the 110-mc crystal oscillator frequency, are converted to 118- to 148-megacycle signals. The converted signal is fed to the R-19 receiver, which is tunable from 118 to 148 megacycles. The converter portion of the TV-10 contains a 228-258 megacycle band-pass network between the uhf antenna connection and a 1N82 crystal mixer. The output from the crystal mixer feeds into the 118-148 mc vhf matching network, whose output feeds into the R-19 receiver input.

1-41. The TV-10, as a component of a uhf Type 12 system, is controlled by Control Unit ARC Type C-52 or equivalent (refer to paragraph 1-63); or as part of a vhf/uhf system, it is controlled by Control Unit ARC Type C-53, or equivalent (refer to paragraph 1-65).

1-42. DESCRIPTION OF DYNAMOTORS.

1-43. DYNAMOTORS ARC TYPES D-10 AND D-10A. (See figure 1-1.)

Note

The D-10A dynamotor supersedes the D-10 dynamotor, which was supplied with early deliveries of certain receivers. D-10 dynamotors and replacement parts thereof are no longer available from the contractor or manufacturer. When the present stock of D-10 dynamotors is exhausted, replace with D-10A.

The D-10 and D-10A dynamotors are completely enclosed and sealed units designed to furnish high voltage to the individual receivers on which they are mounted, and to associated components, such as a vhf transmitter, marker-beacon receiver, or uhf transmitter, included in the system. The dynamotors mount by means of snapslides onto four shock mounts which are an integral part of the receiver chassis. Electrical connections are made through a connector on the dynamotor base which mates with a connector on the receiver chassis. The D-10 dynamotor has a rated input of 2.8 amperes at 14 volts dc or 1.4 amperes at 28 volts dc, and a rated output of 0.06 ampere at 250 volts dc. The D-10A dynamotor has a rated input of 3.4 amperes at 14 volts dc and 1.7 amperes at 28 volts dc, and a rated output of 0.085 ampere at 250 volts dc.

1-44. DESCRIPTION OF CONTROL UNITS.

1-45. GENERAL. Table 1-2 summarizes the types and functions of Type 12 control units, and the mounting types, if any, required for installation. An asterisk enclosed in parentheses (*) following a type number indicates that the unit is available in either a 14-volt or 28-volt model. (Refer to paragraph 1-6.) Paragraphs 1-46 through 1-68 describe the functional, electrical, and physical characteristics of the control units.

TABLE 1-2. CONTROL UNITS OF RADIO SET ARC TYPE 12

CONTROL UNIT			MOUNTING REQUIRED		
ARC TYPE NO.	AN. TYPE NO.	COMPONENT(S) CONTROLLED	TYPE	ARC TYPE NO.	AN. TYPE NO.
C-16	C-1112/ARC	R-11A receiver	Base	M-18	-----
C-17	-----	R-15 receiver	Base	M-18	-----
C-18	C-1113/ARC	L-10 or L-10A loop antenna	Base	M-18	-----
C-24	C-1114/ARC	R-10A, R-11A, and R-15 receivers; two Type 12 transmitters; L-10 or L-10A loop antenna	Base	-----	-----
C-25(14V) C-25(28V)	C-1115/ARC C-1116/ARC	Two Type 12 transmitters; AFM transmitter (not part of Type 12)	Base	M-19	MT-1141/ARC
C-36(*)	-----	R-11A and R-19 receivers; two Type 12 transmitters; L-10 or L-10A loop antenna; FM transmitter (not part of Type 12)	Panel	-----	-----
C-37(*)	C-1117/ARC	R-11A and R-19 receivers; two Type 12 transmitters; FM transmitter (not part of Type 12)	Base	M-13	MT-1143/ARC
C-38(*)	-----	R-11A and R-15 receivers; two Type 12 transmitters; FM transmitter (not part of Type 12)	Base	M-13	MT-1143/ARC
C-39	-----	R-11A and R-19 receivers; two Type 12 transmitters; L-10 or L-10A loop antenna	Panel	-----	-----
C-40	-----	² R-11A and R-19 receivers; AN/ARC-5 receiver (not part of Type 12); two AN/ARC-5 transmitters and FM trans- mitter (not part of Type 12); L-10 or L-10A loop antenna	Panel	-----	-----
C-44	-----	R-11A and R-19 receivers; three Type 12 transmitters; K-12 relay unit	Console	-----	-----
C-46	-----	R-11A and R-19 receivers; two Type 12 transmitters; FM transmitter (not part of Type 12)	Panel	-----	-----
C-47(*)	-----	K-12 relay unit	Base	M-16	-----
C-48(14V) C-48(28V)	----- C-1342/ARN	R-11A receiver; L-10 or L-10A loop antenna	Console	-----	-----
C-49(14V) C-49(28V)	----- C-1341/ARC	R-19 receiver; three Type 12 transmitters	Console	-----	-----

See footnotes at end of table.

TABLE 1-2. CONTROL UNITS OF RADIO SET ARC TYPE 12 (Cont)

CONTROL UNIT			MOUNTING REQUIRED		
ARC TYPE NO.	AN. TYPE NO.	COMPONENT(S) CONTROLLED	TYPE	ARC TYPE NO.	AN. TYPE NO.
C-50(*)	-----	K-12 relay unit	Console	-----	-----
C-52(*)	-----	³ R-19 receiver; two TV-10 transverters; K-13 oscillator- relay unit	Console	-----	-----
C-53(*)	-----	⁴ R-19 receiver; three Type 12 transmitters; one TV-10 transverter; K-13 oscillator- relay unit	Console	-----	-----
C-54	-----	R-15 receiver; K-13 oscillator- relay unit	Base	M-18	-----
C-55	-----	R-19 receiver; K-13 oscillator- relay unit	Base	M-18	-----
C-56(*)	-----	R-19 receiver; three Type 12 transmitters; K-13 oscil- lator-relay unit	Console	-----	-----

1. For base mounting, the unit is secured to a separate mounting by snapslides. For panel mounting, the unit is secured to a mounting surface by mounting holes in the control unit panel. For console mounting, the unit is secured to a standard AN. console framework.
2. AN/ARC-5 receiver frequency dial is removable.
3. Receiver dial calibrated for uhf frequencies only.
4. Receiver dial calibrated for both vhf and uhf frequencies.

1-46. CONTROL UNIT ARC TYPE C-16. (See figure 1-3.) Control Unit ARC Type C-16 provides for remote control of an R-11A receiver. The controls provided include a combined switch-potentiometer to control the application of primary power and to adjust the level of the receiver's r-f sensitivity, a two-position switch to select either a loop antenna or a fixed wire antenna, and a crank for tuning the receiver to the desired frequency. The C-16 requires Mounting ARC Type M-18 for installation.

1-47. CONTROL UNIT ARC TYPE C-17. (See figure 1-3.) Control Unit ARC Type C-17 provides for remote control of an R-15 receiver. The controls provided include a combined switch-potentiometer to control the application of primary power and to adjust the level of the receiver's r-f sensitivity, a two-position switch to select either HI or LO audio level reception, and a crank for tuning the receiver to the desired frequency. The C-17 requires Mounting ARC Type M-18 for installation.

1-48. CONTROL UNIT ARC TYPE C-18. (See figure 1-3.) Control Unit ARC Type C-18 provides for remote control of the orientation of the L-10 or L-10A loop antenna through the use of a crank and a dial. The dial is calibrated to indicate rotation of the loop antenna from 0 to 360 degrees. The C-18 is designed for base mounting by means of Mounting ARC Type M-18.

1-49. CONTROL UNIT ARC TYPE C-24. (See figure 1-3.) Control Unit ARC Type C-24 is a panel-mounted unit designed for remote control of one R-10A receiver, one R-11A receiver, one R-15 receiver, one or two Type 12 vhf transmitters, and one L-10 or L-10A loop antenna. Essentially, it incorporates in one unit the control functions of the C-16, C-17, C-18, and C-25 control units, with an added control for the R-10A receiver. (Refer to paragraphs 1-46, 1-47, 1-48, and 1-50.) The transmitter channels are designated by removable frequency tabs. All electrical and mechanical input and output connections are made at the rear of the enclosure through suitable connectors.

1-50. CONTROL UNIT ARC TYPE C-25. (See figure 1-3.) Control Unit ARC Type C-25 is designed for frequency selection control of one or two Type 12 vhf transmitters and an FM transmitter, such as a type SCR-619. The C-25 control unit includes a sidetone relay to permit interphone communication when switched to the INT position. When switched to the FM position, the C-25 functions to disconnect the microphone and key connections from the transmitter(s) and connect them to the appropriate circuits of the FM transmitter. Because of the relay, the C-25 is supplied for either 14-volt d-c or 28-volt d-c operation, depending on the input voltage rating of the equipment with which it is used. Frequency channels are designated by means of removable tabs. This control unit is designed for base mounting by means of Mounting ARC Type M-19.

1-51. CONTROL UNIT ARC TYPE C-36. (See figure 1-3.) Control Unit ARC Type C-36 is designed for remote control of one R-19 receiver, one R-11A receiver, one or two Type 12 vhf transmitters, an FM transmitter, and one L-10 or L-10A loop antenna. A relay is included to permit the connection of the microphone and key circuits to the FM transmitter, such as the SCR-619, when the microphone switch is closed and the TRANS control is set to FM. Individual combined primary power-sensitivity controls, tuning cranks, and frequency indicating dials are provided for the receivers. The transmitters' frequency selector control is similar to that used in the C-25 control unit (refer to paragraph 1-50). The C-36 is designed for panel mounting. All electrical and mechanical connections are made at the rear of the enclosure through suitable connectors.

1-52. CONTROL UNIT ARC TYPE C-37. (See figure 1-3.) Control Unit ARC Type C-37 is designed for remote control of one R-11A receiver, one R-19 receiver, one or two Type 12 vhf transmitters, and an FM transmitter, such as the SCR-619. Individual combined primary power-sensitivity controls, tuning cranks, and frequency indicating dials are provided for the receivers. A transmitter frequency selector control similar to the C-25 control unit (refer to paragraph 1-50) is included. The C-37 is available in either a 14-volt or a 28-volt model.

1-53. The C-37 control unit is equipped with a relay to disconnect the microphone and key circuits from the Type 12 vhf transmitters and connect them to the FM transmitter. The transmitters' frequency channels, the interphone connection, and the FM connection are designated by removable frequency tabs. All electrical and mechanical input and output connections are made through the bottom side of the enclosure. The C-37 is designed for base mounting by means of Mounting ARC Type M-13.

1-54. CONTROL UNIT ARC TYPE C-38. (See figure 1-3.) With one exception, Control Unit ARC Type C-38 is identical with the C-37 control unit. The VHF dial of the C-38 is calibrated for use with an R-15 receiver instead of an R-19 receiver, as in the C-37. For further details refer to paragraphs 1-52 and 1-53.

1-55. CONTROL UNIT ARC TYPE C-39. (See figure 1-3.) Control Unit ARC Type C-39 is designed for remote control of one R-19 receiver, one R-11A receiver, one or two Type 12 vhf transmitters, and one L-10 or L-10A loop antenna. Individual combined primary power-sensitivity controls, tuning cranks, and frequency indicating dials are provided for the receivers. The transmitter frequency selector control is similar to the C-25 control unit (refer to paragraph 1-50). The C-39 is designed for panel mounting. All electrical and mechanical connections are made through the rear of the enclosure.

1-56. CONTROL UNIT ARC TYPE C-40. (See figure 1-3.) Control Unit ARC Type C-40 is designed for remote control of one R-19 receiver, one R-11A receiver, one L-10 or L-10A loop antenna, components of Model AN/ARC-5 Aircraft Radio Equipment (not part of Type 12 equipment), and an FM transmitter, such as Model SCR-619 (not part of Type 12

equipment) where such equipment is installed in the aircraft. Individual combined primary power-sensitivity controls, tuning cranks, and frequency indicating dials are supplied for the Type 12 R-11A and R-19 receivers. In addition, a combined primary sensitivity control and a tuning mechanism, supplied without a frequency indicating dial, is incorporated to permit remote-control tuning of the AN/ARC-5 receiver, or similar component. The required frequency dial (supplied by the using activity) is attached to the front panel of the control unit. A three-section selector switch is included. This switch simultaneously applies primary power to the transmitter, selects the frequency channel, and connects the appropriate transmitter for the frequency channel selected. The C-40 control unit is designed for panel mounting. All electrical and mechanical connections are made at the rear of the enclosure through suitable connectors.

1-57. CONTROL UNIT ARC TYPE C-44. (See figure 1-3.) Control Unit ARC Type C-44 is an edge-lighted plastic panel, AN, console-mounted component designed to control one R-11A receiver, one R-19 receiver, a K-12 relay unit and up to three Type 12 vhf transmitters, in a dual-control radio communication system. Individual combined primary power-sensitivity controls, tuning cranks, and frequency indicating dials are provided for the receivers. Transmitter crystal frequency selection, and the interphone connection, is made by means of the TRANS switch control. In a dual-control system, where the controls are duplicated, either operator may take control and operate the system by means of a K-12 relay unit, which is controlled by the non-locking push-button switch marked PUSH FOR CONTROL. When the control is effective, the red-lens light assembly on the front panel of the controlling operator's unit lights. Edge-lighting panel illumination is provided by three midget flange-base lamps of the required rating (14 or 28 volts) installed in MS25010-2 red filter light assemblies, and is controlled by the aircraft's panel-lamp control. Electrical connections and mechanical linkage tuning connections are made at the rear of the control unit.

1-58. CONTROL UNIT ARC TYPE C-46. (See figure 1-3.) Control Unit ARC Type C-46, a control unit intended for panel mounting, is designed to perform the same functions as Control Unit ARC Type C-37 (refer to paragraphs 1-52 and 1-53). In addition to the difference in mounting requirements, the C-46 differs from the C-37 as to the location of electrical connectors and mechanical linkage tuning connections, and the method of attaching the crystal frequency tabs around the TRANS switch on the front panel.

1-59. CONTROL UNIT ARC TYPE C-47. (See figure 1-3.) Control Unit ARC Type C-47 is intended for installation in a dual-control radio communication system to permit electrical control of the system to be transferred from one operator to the other. System control is transferred by means of the K-12 relay unit, which is controlled by the PUSH FOR CONTROL non-locking push-button switch. A red-lens indicating lamp lights when control has been transferred to the operator closing the switch. The C-47 requires Mounting ARC Type M-16 for installation.

1-60. CONTROL UNIT ARC TYPE C-48. (See figure 1-3.) Control Unit ARC Type C-48 is an edge-lighted plastic panel, AN, console-mounted component designed to control one R-11A receiver and one L-10 or L-10A loop antenna. The controls consist of a tuning crank for tuning the R-11A to the desired frequency, a combined SENS-OFF control to control the application of primary power and to adjust the level of the receiver's sensitivity, a LOOP-ANT. toggle switch for selecting either a fixed-wire antenna or loop antenna for reception, and a tuning crank for controlling the orientation of the loop antenna, as indicated on the associated dial. Edge-lighting panel illumination is provided by three midjet flange-base lamps of the required rating (14 or 28 volts) installed in MS25010-2 red-filter light assemblies, and is controlled by the aircraft's panel-lamp control. Electrical connections and mechanical linkage tuning connections are made at the rear of the unit.

1-61. CONTROL UNIT ARC TYPE C-49. (See figure 1-3.) Control Unit ARC Type C-49 is an edge-lighted plastic panel, AN, console-mounted component designed to control one R-19 receiver and up to three Type 12 vhf transmitters. The controls consist of a combined SENS-OFF control to control the application of primary power and to adjust the level of the receiver's r-f sensitivity, a TRANS rotary switch for transmitter crystal frequency and interphone connection, and a tuning crank for tuning the receiver to the desired frequency, as indicated on the associated dial marked MC. Edge-lighting panel illumination is provided by three midjet flange-base lamps of the required rating (14 or 28 volts) installed in MS25010-2 red-filter light assemblies, and is controlled by the aircraft's panel-lamp control. Electrical connections and mechanical linkage tuning connections are made at the rear of the unit.

1-62. CONTROL UNIT ARC TYPE C-50. (See figure 1-3.) Control Unit ARC Type C-50, an edge-lighted plastic panel, AN, console-mounted component, is intended for installation in a dual-control radio communication system to permit electrical control of the system to be transferred from one operator to the other. System control is transferred by means of the K-12 relay unit, which is operated by the non-locking, push-button PUSH FOR CONTROL switch. A red-lens indicating lamp, located on the front panel, lights when the control is effective.

1-63. CONTROL UNIT ARC TYPE C-52. (See figure 1-3.) Control Unit ARC Type C-52 is an edge-lighted plastic panel, AN, console-mounted unit designed to control one R-19 receiver for uhf reception only, one K-13 oscillator-relay, and one or two TV-10 transverters. The frequency dial, marked MC, is calibrated for use in the uhf band of 228 to 258 mc. The controls comprise a combined VOL-OFF control to control the application of primary power and to adjust the audio level of the receiver output, a TRANS selector switch for interphone connection and selection of up to 16 uhf transmitting channels, and a combined receiver tuning control and "whistle-through" control to operate the K-13. Edge-lighted panel illumination is provided by three midjet flange-base lamps of the required rating

(14 or 28 volts) installed in MS25010-2 red-filter light assemblies, and is controlled by the aircraft's panel-lamp control. Electrical connections and mechanical linkage connections are made at the rear of the unit.

1-64. CONTROL UNIT ARC TYPE C-53. (See figure 1-3.) Control Unit ARC Type C-53 is an edge-lighted plastic panel, AN, console-mounted component designed to control one R-19 receiver for vhf or uhf reception, up to three Type 12 vhf transmitters, one K-13 oscillator-relay, and one TV-10 transverter. The frequency dial is calibrated for both a vhf band of 118 to 148 mc and a uhf band of 228 to 258 mc. Provisions are made so that only one band will be visible at a time. The controls consist of a combined VOL-OFF control to control the application of primary power and to adjust the audio level of the receiver output; a TRANS selector switch for selection of up to 15 vhf frequency channels, interphone, and eight uhf channels; and a combined receiver tuning and "whistle-through" control. Edge-lighting for panel illumination is provided by three midjet flange-base lamps of the required rating (14 or 28 volts) installed in MS25010-2 red-filter light assemblies, and is controlled by the aircraft's panel-lamp control.

1-65. When the TRANS switch is changed from the vhf band position (alphabetical positions) to the uhf band (numerical positions), the frequency indicating dial shifts to expose the uhf frequencies; the uhf transmitter circuit of the TV-10 is ready for operation; the uhf receiver-converter circuit of the TV-10 is turned on and connected to the R-19 receiver input; and the A-16 uhf antenna replaces the A-15 vhf antenna.

1-66. CONTROL UNIT ARC TYPE C-54. (See figure 1-3.) Control Unit ARC Type C-54 is designed to control an R-15 receiver. The controls consist of an OFF control to control the application of primary power and to adjust the audio level of the receiver output, and a combined receiver tuning and "whistle-through" control which is used, in conjunction with a K-13 oscillator relay, to tune the receiver precisely to a vhf transmitter crystal frequency. The C-54 is intended for base installation using Mounting ARC Type M-18.

1-67. CONTROL UNIT ARC TYPE C-55. (See figure 1-3.) Except for its intended use to control an R-19 receiver, requiring a different frequency dial, the C-55 is identical to the C-54 control unit described in paragraph 1-66.

1-68. CONTROL UNIT ARC TYPE C-56. (See figure 1-3.) Control Unit ARC Type C-56 is an edge-lighted plastic panel, AN, console-mounted component designed to control one R-19 receiver, one K-13 oscillator-relay, and up to three Type 12 vhf transmitters. The controls consist of: a combined VOL-OFF control to control the application of primary power and to adjust the audio level of the receiver output; a TRANS selector switch for interphone connection and selection of up to 16 vhf transmitting channels; and a combined receiver tuning and "whistle-through" control, which permits precise tuning of the receiver to a transmitter crystal frequency when used with a K-13 oscillator-relay. Edge-lighted panel illumination is provided

by three midget flange-base lamps of the required rating (14 or 28 volts) installed in MS25010-2 red-filter light assemblies, and is controlled by the aircraft's panel-lamp control. Electrical connections and mechanical linkage connections are made at the rear of the unit.

1-69. DESCRIPTION OF ANTENNAS.

1-70. ANTENNA ARC TYPE A-12. (See figure 1-4.) Antenna ARC Type A-12 is a vhf, 25-inch, quarter-wave, base-fed antenna, requiring only a single-hole mounting. The mast section is easily removable by unscrewing it from the base, thus facilitating replacement. The A-12 is designed for use with the R-15 receiver or T-11B transmitter, or similar components. The A-12 antenna is meant for use on aircraft which have cruising speeds up to 200 mph and which do not have de-icing equipment. Where all-weather flying is indicated, a Type AN-104B antenna should be substituted. If an AN-104B is used, an adapter (ARC-11368) is required for connection from the antenna cable's BNC connector to the antenna's uhf connector. The base of the A-12 includes a UG-290/U connector for connecting the transmission line, such as RG-58/U coaxial cable.

1-71. ANTENNA ARC TYPE A-15. (See figure 1-4.) Antenna ARC Type A-15 is a vhf, quarter-wave, base-fed, inverted-L antenna. It consists of a solid stainless steel, L-shaped rod, flexibly mounted in rubber to a small aluminum box. The flexible mounting increases the reliability of operation under mild icing conditions, and also allows for movement of the antenna, which minimizes the possibility of damaging the antenna if it should come in contact with obstacles on the ground. The aluminum box is the coupling box and contains an impedance matching network and a UG-290A/U connector for connecting the transmission line, such as RG-58/U coaxial cable. Though primarily intended for under-fuselage mounting, the A-15 may also be mounted on top. The voltage standing wave ratio (vswr) is less than 3:1 in the frequency range of 116-148 mc.

1-72. ANTENNA ARC TYPE A-16. (See figure 1-4.) Antenna ARC Type A-16 is a quarter-wave, base-fed, inverted-L antenna designed to operate in the uhf band. It consists of a stainless steel, L-shaped rod, mounted on a small aluminum box. The box contains a broad-banding circuit and a UG-290A/U connector for connecting the transmission line, such as RG-58/U coaxial cable. The A-16 is intended for under-fuselage mounting. It will function satisfactorily under mild icing conditions and at air speeds up to 500 mph, or better. Within the frequency range of 228-258 mc, it has a vswr of less than 2:1.

1-73. LOOP ANTENNAS ARC TYPE L-10 AND L-10A. (See figure 1-4.)

Note

Antenna ARC Type L-10A supersedes the Type L-10. The two components are functionally interchangeable. In the L-10A, the slip-ring arrangement was modified to reduce static during rotation, and the base assembly was revised. The description which follows is applicable to both, though only the L-10A is referenced.

Loop Antenna ARC Type L-10A is a 9-inch diameter rotating antenna designed for top or bottom mounting on aircraft. It provides for aural direction-finding or homing reception. The L-10A is designed for remote control only through the use of Control Unit ARC Type C-18, or a similar component, which may be located as much as 20 feet away and which controls rotation of the L-10A from 0 to 360 degrees. Ease of rotation is effected through the use of ball bearings and a high-ratio worm-gear drive. The L-10A has an inductance of 16 microhenries, a distributed capacity of 69 uuf, and a Q of 46 at 400 kc.

1-74. ANTENNA KIT ARC-12296. (See figure 1-4.) Antenna Kit ARC-12296 includes the necessary parts to install a fixed-wire antenna for use with the R-10A, R-11A, or R-20 receivers, or similar component. The kit includes copper-clad steel antenna wire, lead-in wire, insulators, an antenna-tension spring, and other fittings required for proper installation on aircraft.

1-75. DESCRIPTION OF RELAY UNITS.

1-76. MUTING RELAY ARC TYPE K-11. (See figure 1-5.) Muting Relay ARC Type K-11 consists of a single-pole, double-throw relay and a terminal board, mounted on an aluminum base. The detail parts are enclosed by a snapslide-attached cover. Wiring to the terminal board and relay is brought in through a rubber grommet. Two holes in the base are provided for installation.

1-77. RELAY UNIT ARC TYPE K-12. (See figure 1-5.) Relay Unit ARC Type K-12 is used in conjunction with C-44, C-47, and C-50 control units, or equivalent, for control switching in dual-control installations. The K-12 consists of an aluminum box containing six control relays, three power relays, two keying relays, and two supervisory and switching relays, for switching electrical control of the radio equipment from a control unit in one cockpit to a duplicate control unit in the other cockpit. The K-12 requires the use of Mounting ARC Type M-20 for installation.

1-78. OSCILLATOR-RELAY UNIT ARC TYPE K-13. (See figure 1-5.) Oscillator-Relay Unit ARC Type K-13 is designed for use with any Type 12 control unit that includes a "whistle-through" control. It makes possible the precise tuning of a Type 12 vhf receiver, such as the R-15 or R-19, to a crystal-controlled Type 12 vhf transmitter frequency. The K-13 is operated when the applicable receiver's tuning crank is pushed. The K-13 has the following functions: to connect high voltage to the receiver and transmitter simultaneously; to reduce the receiver sensitivity to a low value; to connect the transmitter output to a 50-ohm dummy load; to switch the microphone out of the circuit; to turn on a neon lamp relaxation-type oscillator, the a-f output of which is injected into the microphone input circuit to provide about 20 percent tone modulation; and to connect the headset (TEL line) to the output of the receiver being tuned, while disconnecting it from all other receivers.

1-79. The K-13 includes a VHF WHISTLE LEVEL adjustment and a UHF WHISTLE LEVEL adjustment. These are preset and locked, and must not be disturbed by the operator. High voltage is obtained from the associated receiver and low voltage from the existing primary power source. The K-13 requires Mounting ARC Type M-24 for installation. All connectors and controls are located on the front of the unit.

1-80. DESCRIPTION OF MOUNTINGS.

1-81. The mountings for the receivers, transmitters, control units, and relay units are either a plate-type or shock-proof vibration-mount type. (See figure 1-6.) In all cases, suitable holes are provided for fastening the mounting to a shelf or bulkhead. The component is mounted and then secured by snapslides engaging the grooved studs on the mounting. The vibration-type mountings have flat, beryllium copper straps on the underside for ground connections. The plate-type mountings have disc-type springs on the top of the plate for mounting tension. Table 1-3 lists the mountings by type number, physical type, and uses.

TABLE 1-3. MOUNTINGS FOR RADIO SET
ARC TYPE 12 COMPONENTS

Mounting	Type	Uses
M-11A	Shock-mount	T-11A, T-11B, T-13, T-13A
M-12A	Shock-mount	R-10A, R-11A, R-15, R-19, TV-10
M-13	Plate	C-37, C-38
M-16	Plate	C-47
M-18	Plate	C-16, C-17, C-18, C-54, C-55
M-19	Plate	C-25
M-20	Plate	K-12
M-23	Shock-mount	R-20
M-24	Plate	K-13

1-82. DESCRIPTION OF JUNCTION BOXES.

Note

Junction Boxes ARC Type J-13A and Type J-15A supersede Types J-12, J-13, and J-15. Information concerning the superseded types is included for reference purposes only since they are no longer available.

1-83. GENERAL. Junction boxes are used to facilitate the cabling of multi-unit systems. The junction boxes are potash-dipped, aluminum alloy boxes with

snapslide covers permitting easy and convenient access to the interior. Barrier-type terminal boards are used for the wiring terminations, which are secured by nuts to the terminal posts. Each terminal is numbered, except ground terminals which are identified by the letter "G" adjacent to the terminal.

1-84. JUNCTION BOX ARC TYPE J-12. (See figure 1-7.) Junction Box ARC Type J-12 provides 32 terminals plus four ground terminals, a single-pole, double-throw relay, and three 20-ampere fuses for receiver protection. The terminals are arranged in pairs with wire-securing nuts, except for those associated with the relay and fuses, which have one nut and one binding-head screw. The base of the box has five rubber-grommet openings and six collet-type openings, through which the wiring is brought into the box. The J-12 is designed for bulkhead mounting by means of four holes in the base of the box. A hole in each corner of the base permits drainage of accumulated moisture.

1-85. JUNCTION BOXES ARC TYPE J-13 AND J-13A. (See figure 1-7.) Junction Box ARC Type J-13 provides 30 terminals plus four ground terminals, a single-pole, double-throw relay, and three 20-ampere fuses for receiver protection. The J-13A is similar, except that it does not include fuses, so that 33 terminals plus four ground terminals are available. The terminals are arranged in pairs with wire-securing nuts, except for those associated with the relay and fuses, which have one nut and one binding-head screw. Nine rubber-grommet openings are available for wire feed-through. The J-13 and J-13A are mounted by means of four holes in the base of the box. A hole in each corner of the base permits drainage of accumulated moisture.

1-86. JUNCTION BOXES ARC TYPE J-15 AND J-15A. (See figure 1-7.) Junction Boxes ARC Type J-15 and J-15A each provide 56 terminals and seven rubber-grommet openings. The J-15A also includes a relay for primary power application in those Type 12 installations where the total current requirement exceeds 5 amperes. In all other respects, the J-15 is the same as the J-13, and the J-15A is the same as the J-13A. Refer to paragraph 1-85.

1-87. DESCRIPTION OF JACK BOX ARC TYPE J-10.

1-88. Jack Box ARC Type J-10 (see figure 1-7) provides a microphone input jack and a telephone (headset) input jack, and two collet-type openings for wiring connections into and out of the box. The J-10 is mounted by means of two holes in its base.

1-89. ACCESSORIES.

1-90. Accessory items include interconnecting cable parts such as adapters, connectors, bulk cable, cable assemblies, mechanical linkage parts, and mechanical linkage assemblies. Also included are quartz crystals, headset and microphone brackets, a headset, a microphone, telephone plugs, tools, and other miscellaneous parts required to supplement the individual airplane installation. These parts are shown in figures 1-8 and 1-9 and are listed in table 1-1.

SECTION II

OPERATING PROCEDURES

2-1. GENERAL OPERATION INFORMATION.

2-2. INTERCHANGEABILITY OF COMPONENTS. The components of Radio Set ARC Type 12 may be combined in various ways to suit the individual airplane requirements. These may vary from a one-receiver/one-transmitter system to a combined lf-vhf-uhf receiver-transmitter system, either of which may, in addition, be part of a single- or dual-control installation. The flexibility of Radio Set ARC Type 12 is such, that without affecting intercabling, the following components may be interchanged: Radio Receivers ARC Type R-15 and R-19, Radio Receivers R-10A and R-11A, Radio Transmitters T-11A, T-11B, T-13, and T-13A, and Antennas ARC Type A-12 and A-15. Because the frequency coverage of some of these interchangeable components varies, frequency indicating dials and transmitting frequency tabs must be changed, or appropriate control units installed as required.

2-3. SENSITIVITY AND VOLUME CONTROLS. Different methods of controlling headset (or loudspeaker) audio level are used in Type 12 installations. In one method, the receiver's r-f sensitivity is varied. This is accomplished by connecting the associated control unit's audio level control, usually marked SENS, in the cathode circuit of the first r-f stage. This method is used for the R-10A and R-11A receivers. In some installations it is also used for the R-15 and R-19 receivers. Where this method is used for R-15 and R-19 receivers, the associated control unit also has a LO-HI switch. This switch, in the LO position, connects a fixed resistor into the cathode circuit of the final audio-frequency stage, introducing degeneration, and causing an audio level decrease of approximately 10:1. In the HI position, the resistor is not connected. In still another method being used to control the audio level of R-15 and R-19 receivers, the LO-HI switch is omitted, and the associated control unit's audio level control, usually marked VOL, is connected across the secondary of the receiver's output transformer in the final audio-frequency stage. In later models of the R-15 and R-19 receivers, a front-panel-mounted variable resistor (not for operator's use) is connected in the cathode circuit of the noise limiter - first audio amplifier. This resistor is adjusted, and the setting locked, at the time of installation; depending on the setting, background noise is limited to permit high-level settings of the associated VOL (or SENS) control.

2-4. SENSITIVITY SETTING. In order that the incoming signal level may be kept below the range of avc

action when operating the R-10A or R-11A receiver in a high-signal-strength area, it is advisable to adjust the r-f sensitivity of the receiver, by means of the associated control unit's SENS control, to a minimum usable setting, to avoid the possibility of course-broadening. Automatic volume control is desirable for ground-to-air reception, but its action is highly undesirable in an application where determination of relative signal strength is a requirement.

2-5. SIMULTANEOUS OPERATION OF RECEIVERS WITH LOOP ANTENNA. The R-10A and R-11A receivers may be operated simultaneously from a common fixed-wire antenna. However, when a common loop antenna is being used, only one receiver should be connected to it at a time for optimum results. To satisfy this requirement, check that the ANT.-LOOP switch, on the control assembly for the receiver being operated with the loop antenna, is set to the LOOP position, while the other receiver's ANT.-LOOP switch is set to ANT.

2-6. DUAL-CONTROL INSTALLATION. In a dual-control installation the mechanical and electrical controls are provided in duplicate so that either operator may take control and operate the system. Control is transferred when the PUSH FOR CONTROL switch on the control unit is depressed. However, the installation is wired so that one operator may take and retain control of the system, regardless of the action of the other operator, by maintaining his PUSH FOR CONTROL switch in a depressed condition.

2-7. TRANSMITTER CRYSTALS. Transmitter crystals are ordinarily installed in ascending order of frequency with the lowest frequency in position 1. Where transmitting frequency tabs are installed around the TRANS selector switch, they should be arranged in a corresponding order in a clockwise direction.

CAUTION

Operating frequencies of the vhf transmitters (T-11A, T-11B, T-13, T-13A) must be kept within a 2-megacycle band of the transmitters' frequency range. Operating frequencies of the uhf transmitter section of the TV-10 must be kept within a single 4-megacycle band, or divided between two 4-megacycle bands with at least a 2-megacycle separation. Operation outside any of these limits will result in a loss of power output at the extremes of the band.

2-8. OPERATING CONTROLS. All operating controls for the components of Radio Set ARC Type 12 are located on the control units. This centralizes the point of operation and facilitates the required operating procedures. The purpose and characteristics of the control units are described in paragraphs 1-46 through 1-68.

2-9. PREFLIGHT OPERATING PROCEDURES. Procedures for checking equipment operation prior to flight are described in paragraphs 2-15 through 2-20. Though these procedures are concerned specifically with receiver and transmitter operation, in effect all operating accessory components such as control units, relay units, etc., are checked out at the same time.

2-10. AIRBORNE OPERATING PROCEDURES. Airborne operating procedures are given in paragraphs 2-22 through 2-30.

2-11. SUMMARY OF USES OF EQUIPMENT. The receiver and transmitter components of Radio Set ARC Type 12 will provide the following:

Air-to-ground vhf transmission, on 116-132 mc, using the T-11A or T-11B transmitter, or on 132-148 mc, with a possible shift downward to 125-132 mc by means of a capacity plate (refer to paragraph 1-35), using the T-13A or T-13B transmitter. These frequency bands permit communication between aircraft and CAA towers and communications stations, and all military towers.

Air-to-ground uhf transmission, using a TV-10 transverter, on 228 to 258 mc.

Reception of ground-to-air communication and navigation signals in the frequency range of 190 to 550 kc, using the R-11A receiver. This frequency

band includes CAA four-course ranges; Navy ranges; Marine beacons; CAA, Air Force, and Navy low-frequency tower communications; and the 500-kc distress frequency.

Reception of ground-to-air signals in the frequency range of 520 to 1500 kc, using the R-10A receiver. This frequency band includes commercial broadcast stations.

Manual direction-finding facilities, using a loop antenna and either the 190-550 kc (R-10A) or 520-1500 kc (R-11A) facilities described previously.

Reception of ground-to-air vhf communications on any channel in the frequency range of 108-135 mc, using the R-15 receiver, or 118 to 148 mc, using the R-19 receiver. These frequencies include all CAA and Air Force towers; CAA and Air Force communications stations; CAA, Air Force, and Navy GCA; and the universal emergency frequencies.

Reception of ground-to-air uhf signals in the frequency range of 228-258 mc, using a TV-10 transverter in conjunction with an R-19 receiver.

Visual and aural reception of 75-mc marker-beacon signals, using the R-20 receiver.

2-12. LOCATION AND FUNCTION OF OPERATING CONTROLS.

2-13. Figures 2-1 through 2-20 locate and describe the function of the individual controls of the control units. The illustrations, which follow, are grouped together and arranged in numerical sequence of type number to facilitate their use. Instructions for operating the components follow figures 2-1 through 2-20.

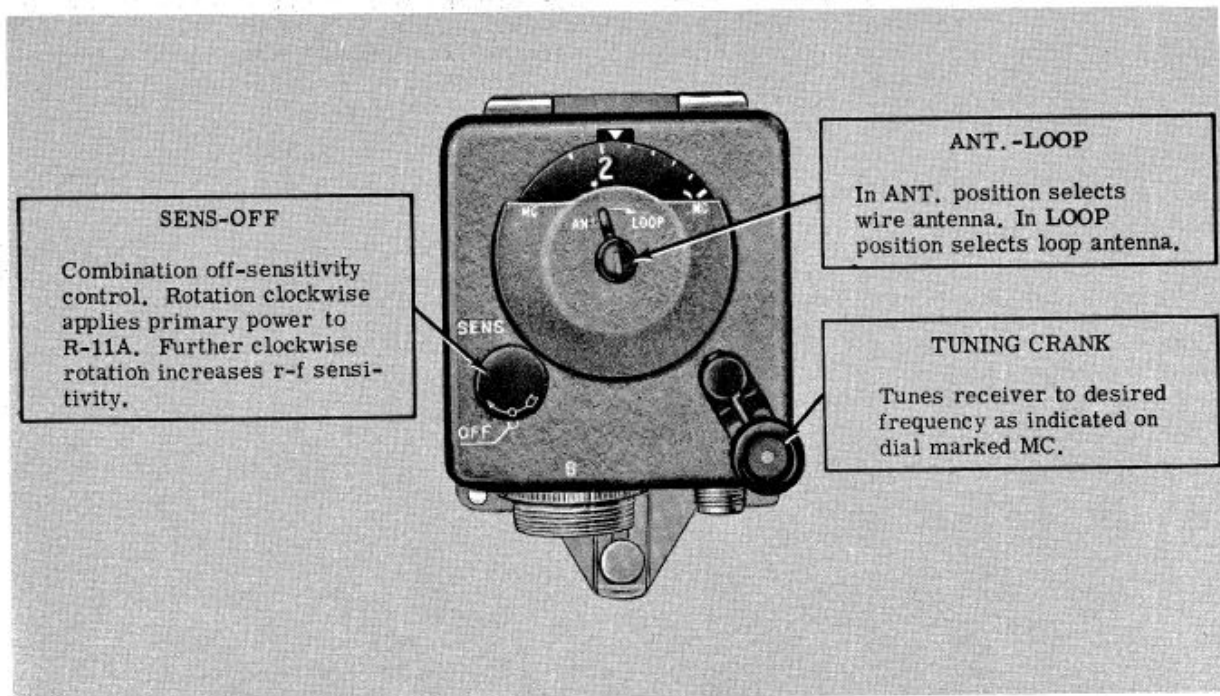


Figure 2-1. Control Unit ARC Type C-16, Location and Function of Operating Controls

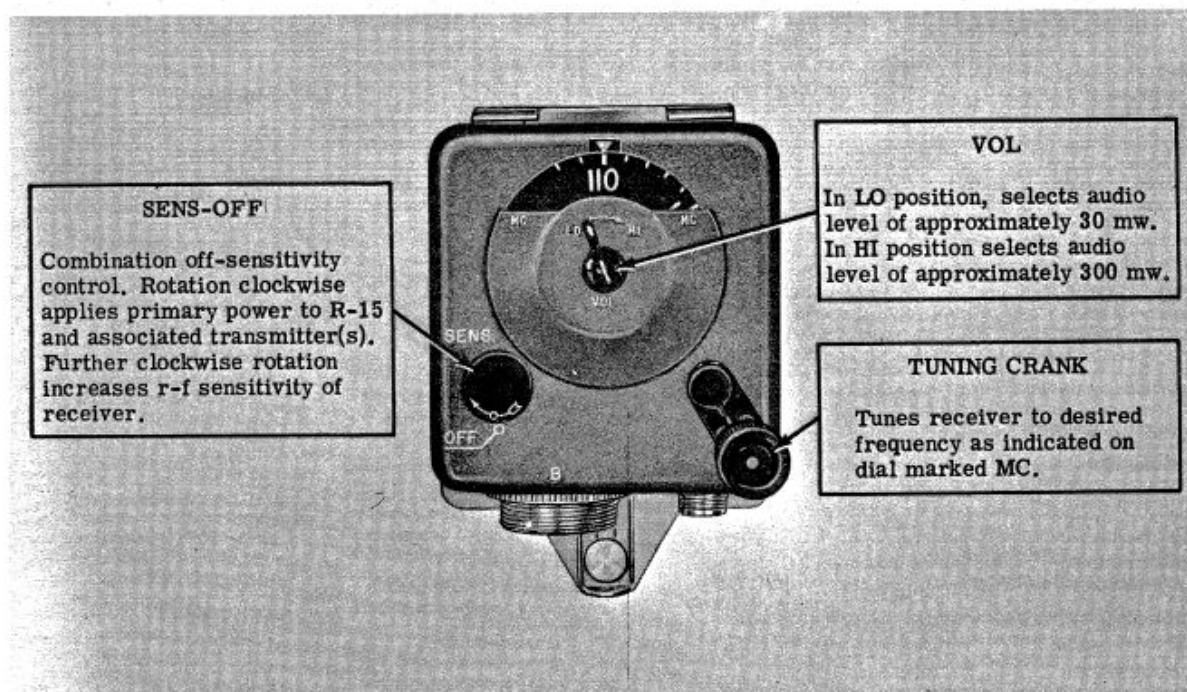


Figure 2-2. Control Unit ARC Type C-17, Location and Function of Operating Controls

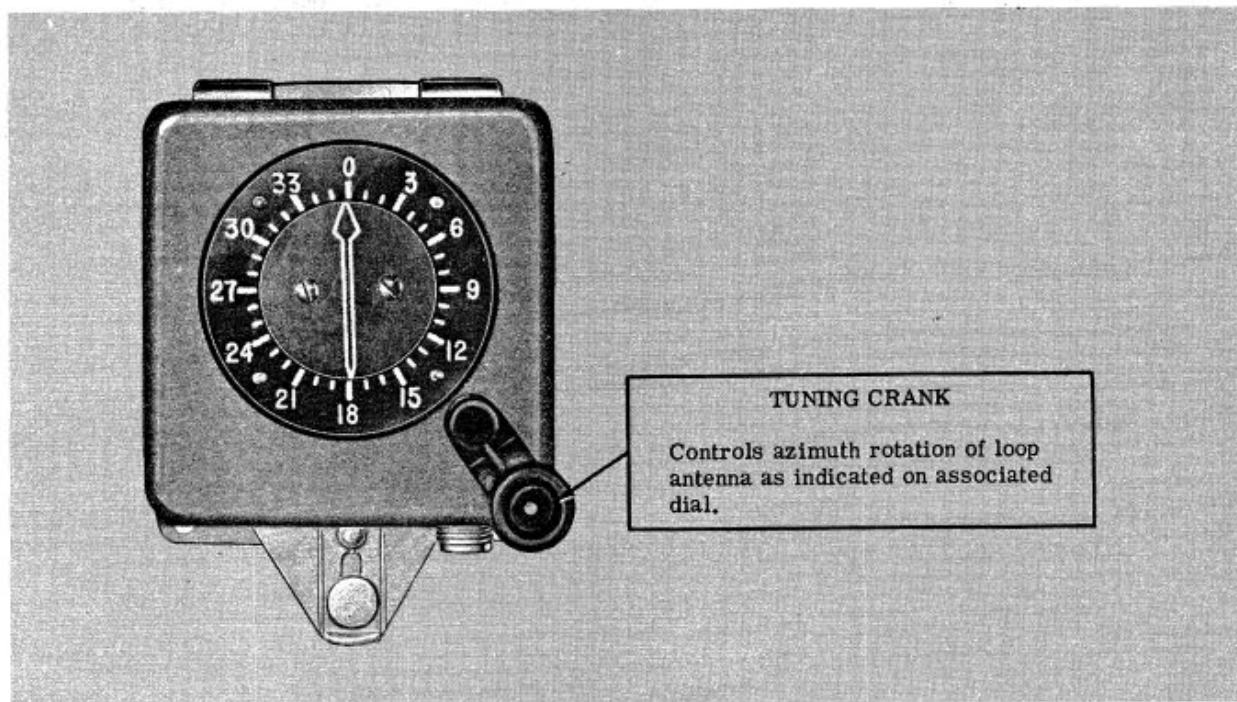


Figure 2-3. Control Unit ARC Type C-18, Location and Function of Operating Control

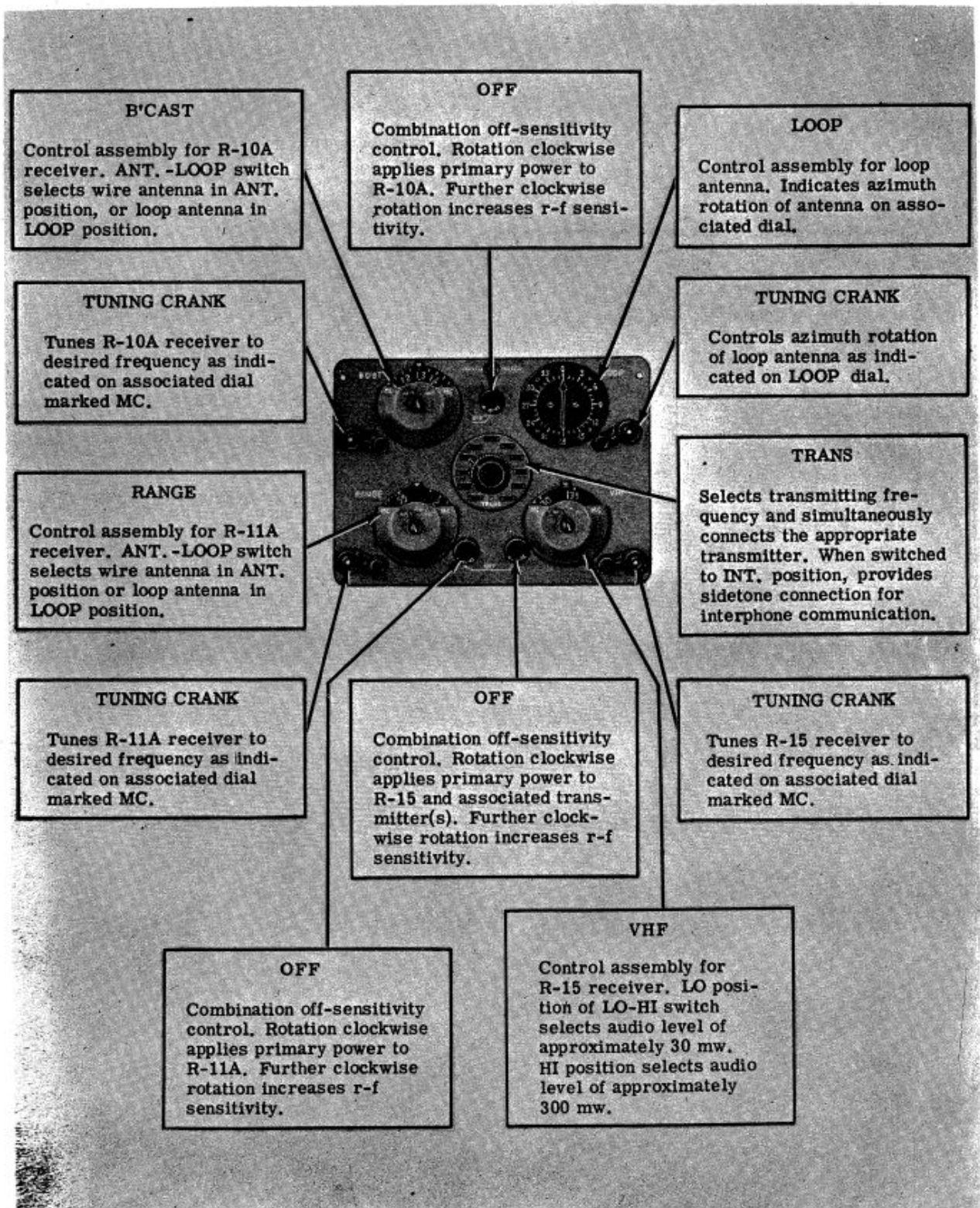


Figure 2-4. Control Unit ARC Type C-24, Location and Function of Operating Controls

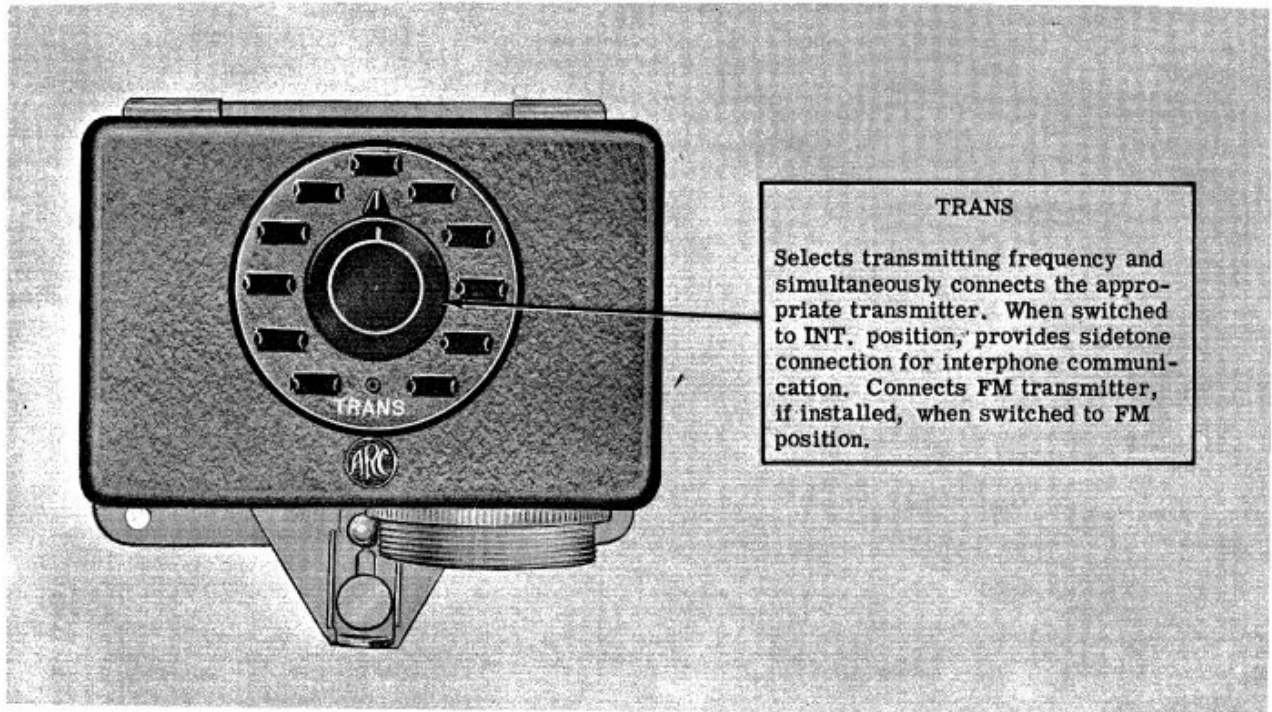


Figure 2-5. Control Unit ARC Type C-25, Location and Function of Operating Controls

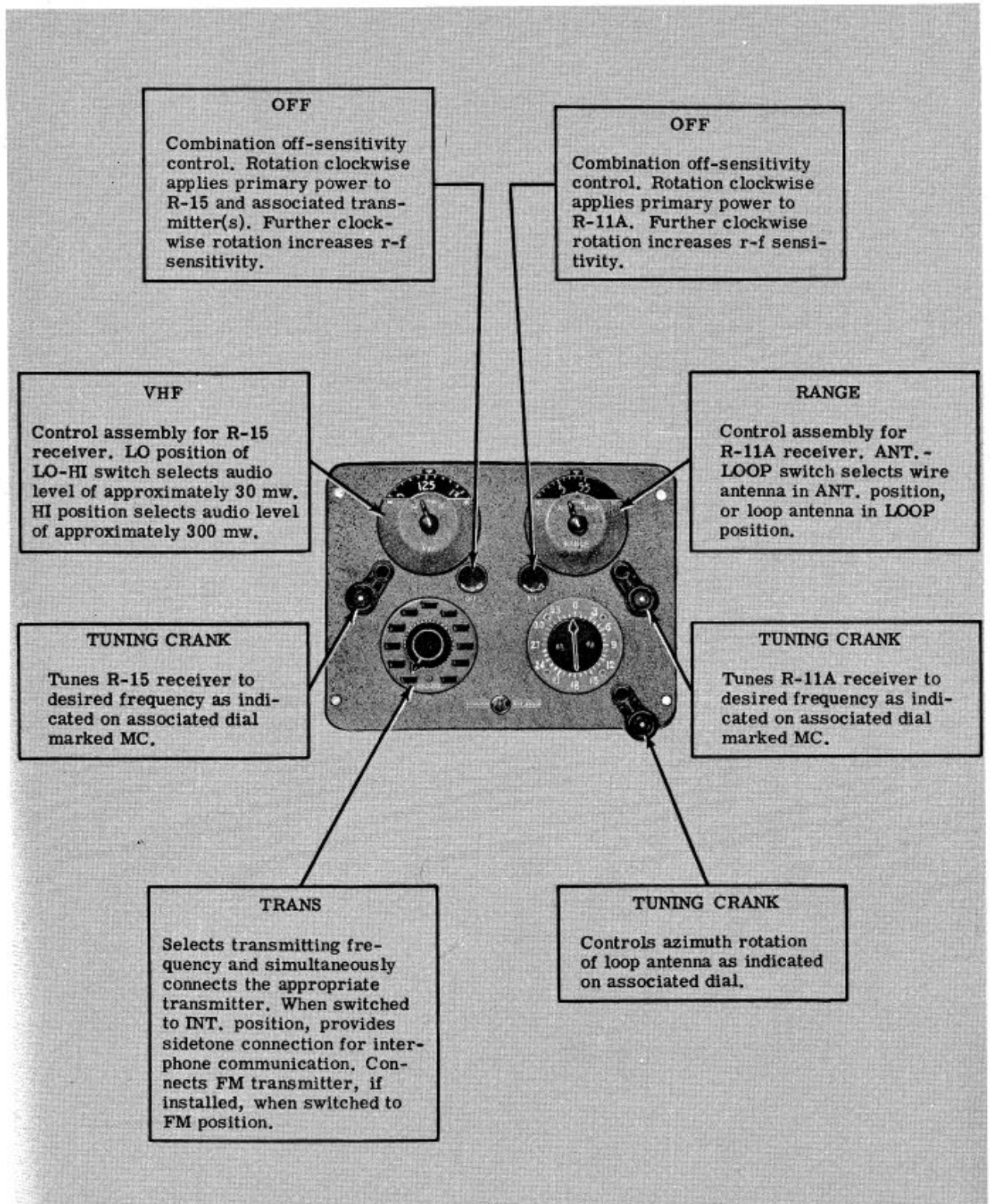


Figure 2-6. Control Unit ARC Type C-36, Location and Function of Operating Controls

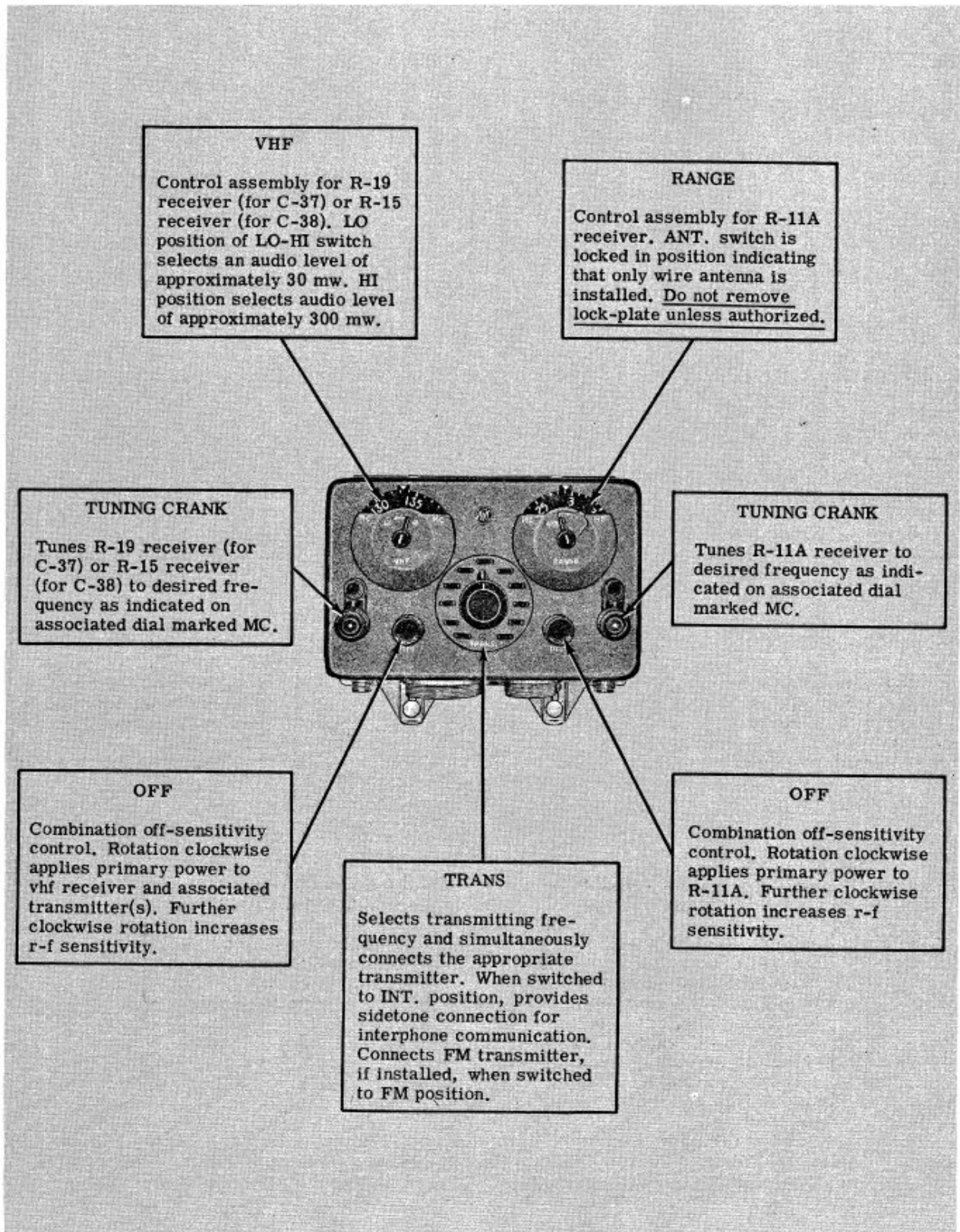


Figure 2-7. Control Units ARC Type C-37 and C-38, Location and Function of Operating Controls

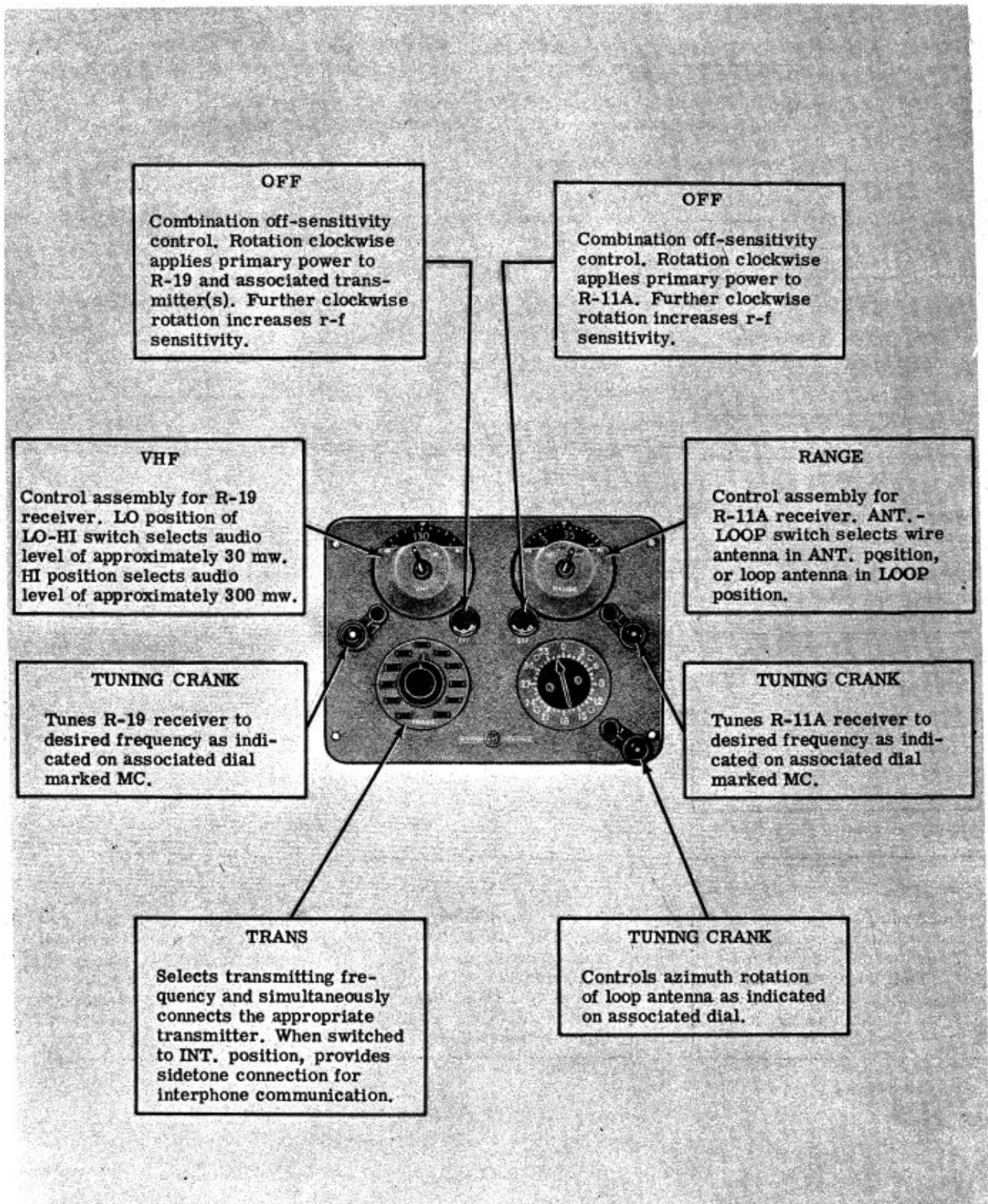


Figure 2-8. Control Unit ARC Type C-39, Location and Function of Operating Controls

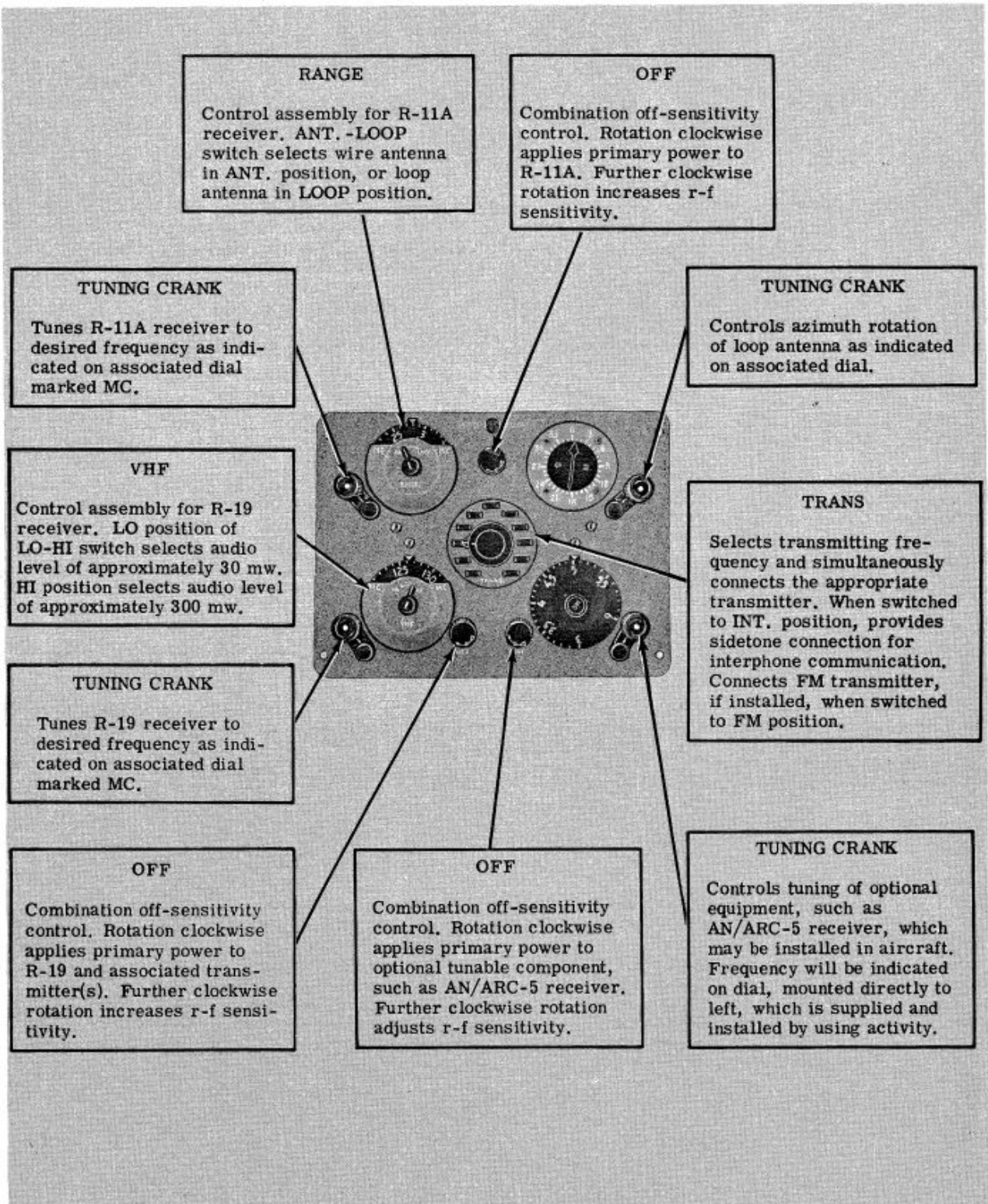


Figure 2-9. Control Unit ARC Type C-40, Location and Function of Operating Controls

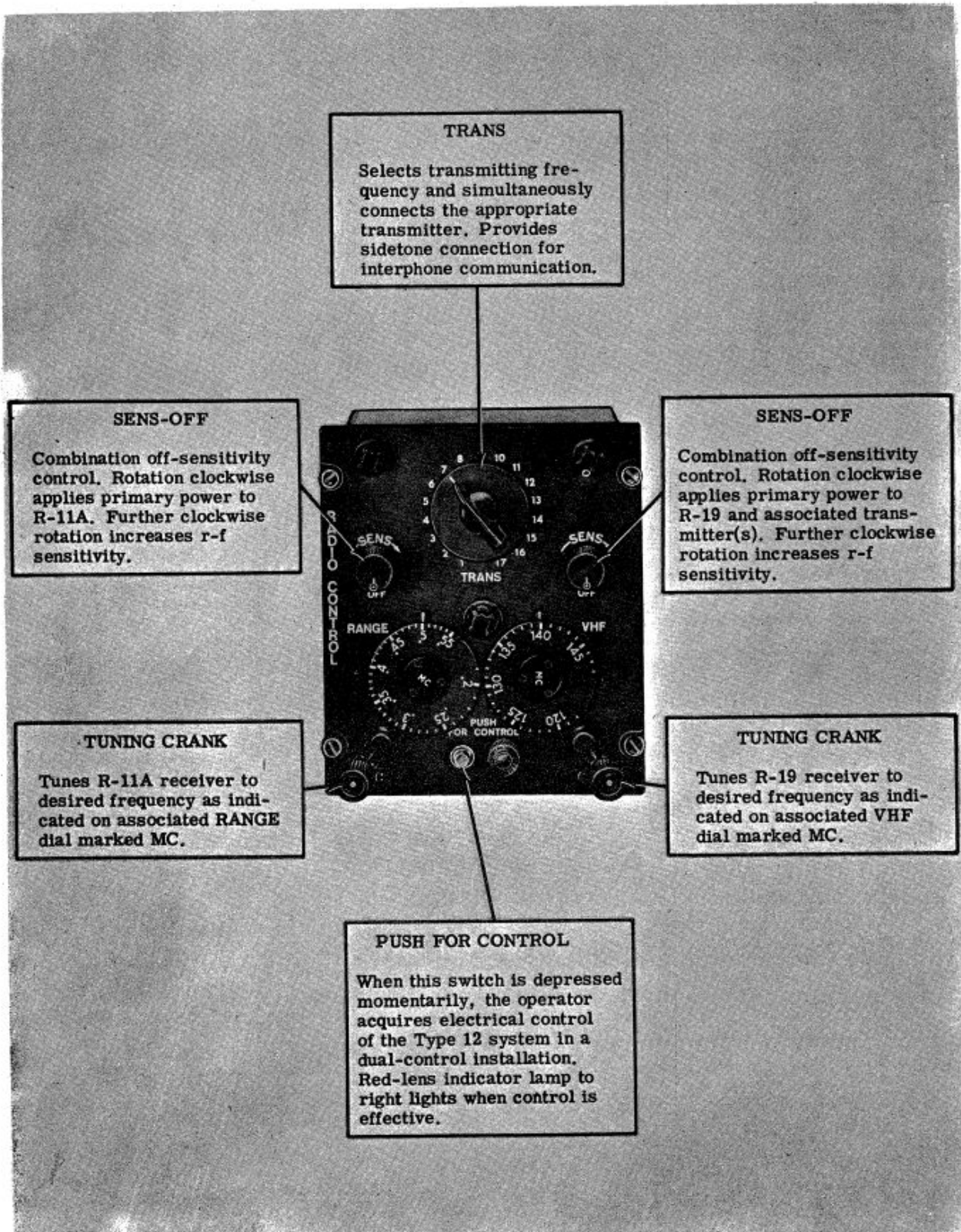


Figure 2-10. Control Unit ARC Type C-44, Location and Function of Operating Controls

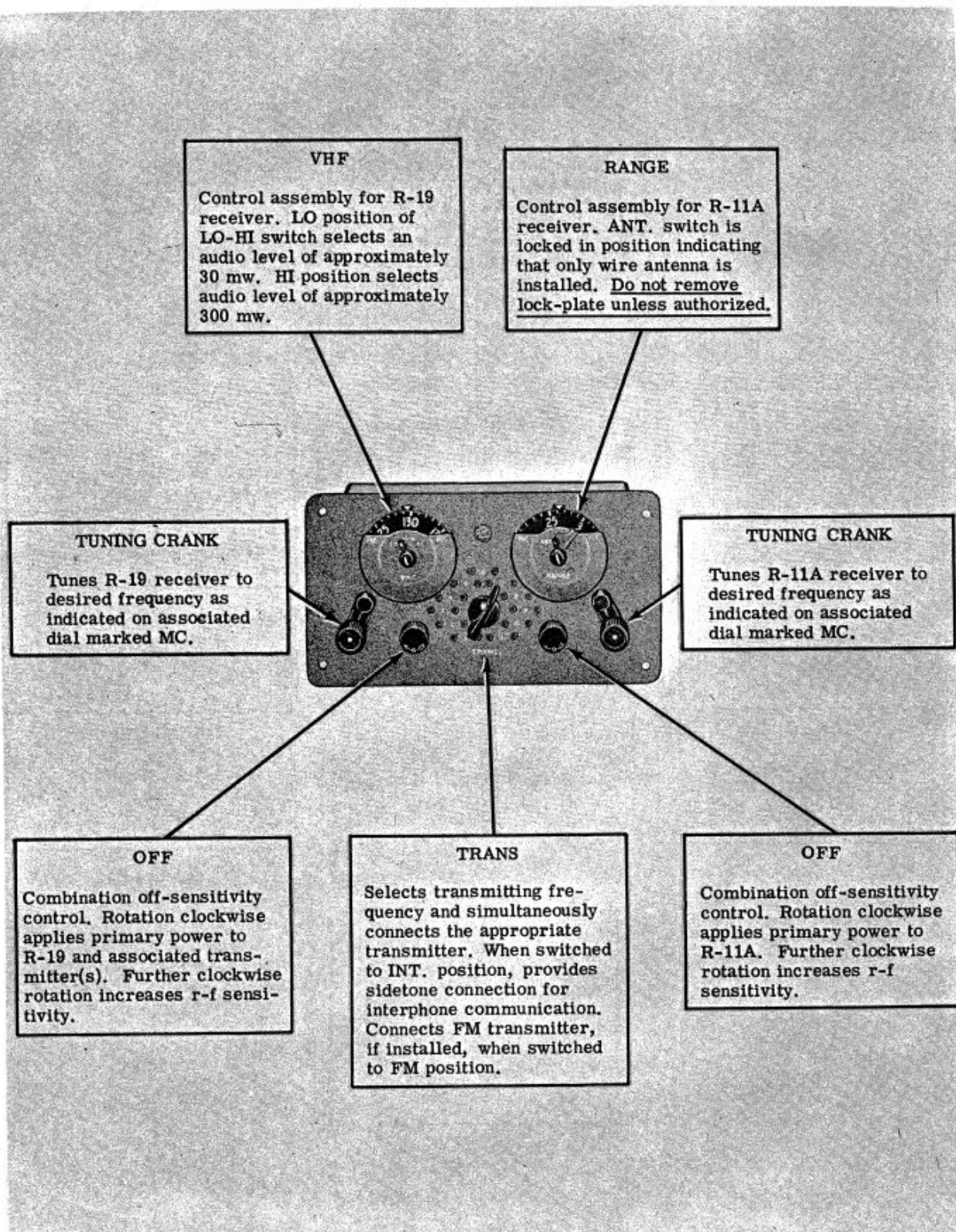


Figure 2-11. Control Unit ARC Type C-46, Location and Function of Operating Controls

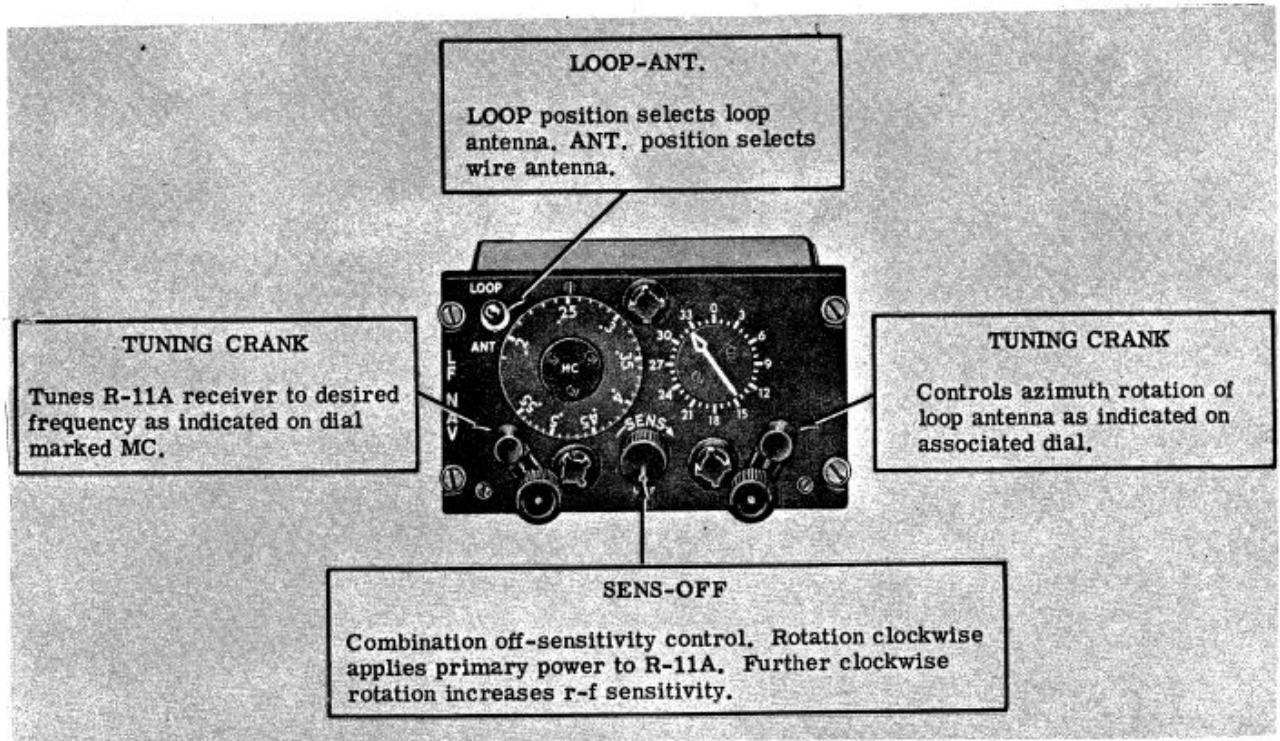


Figure 2-12. Control Unit ARC Type C-47, Location and Function of Operating Controls

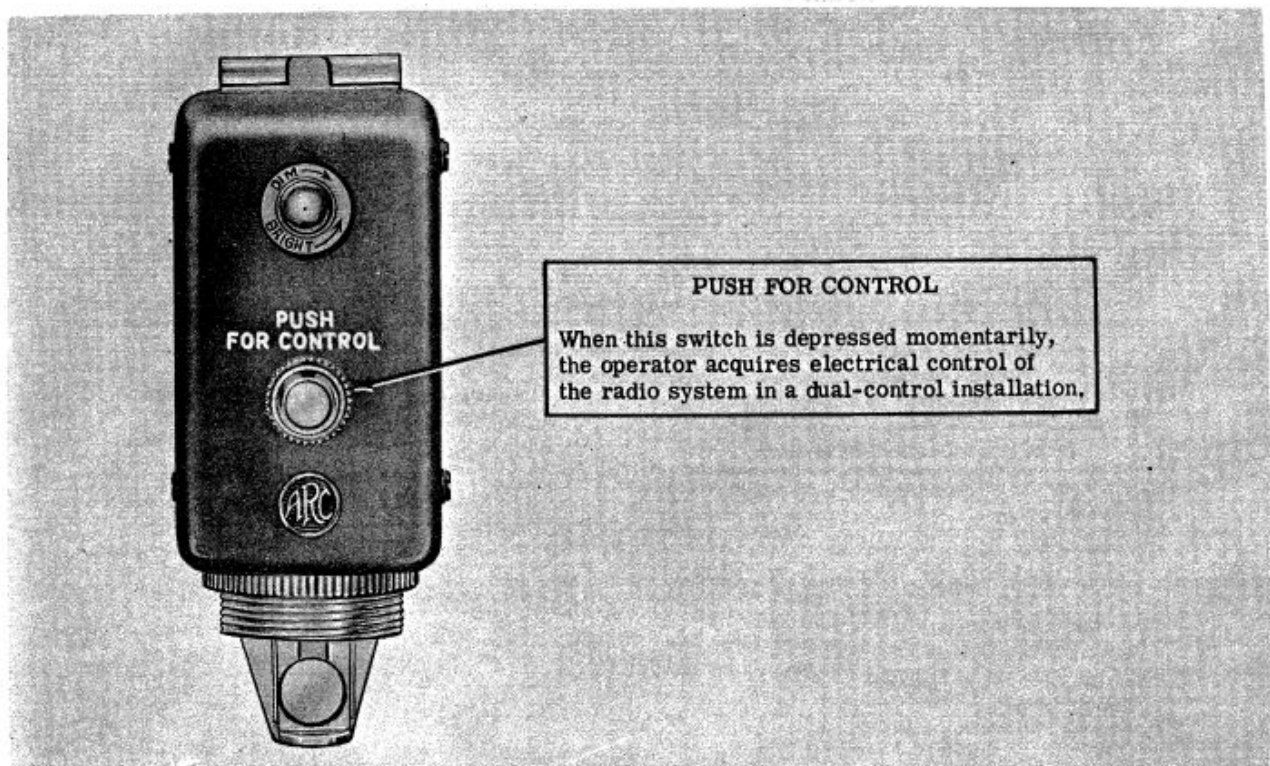


Figure 2-13. Control Unit ARC Type C-48, Location and Function of Operating Controls

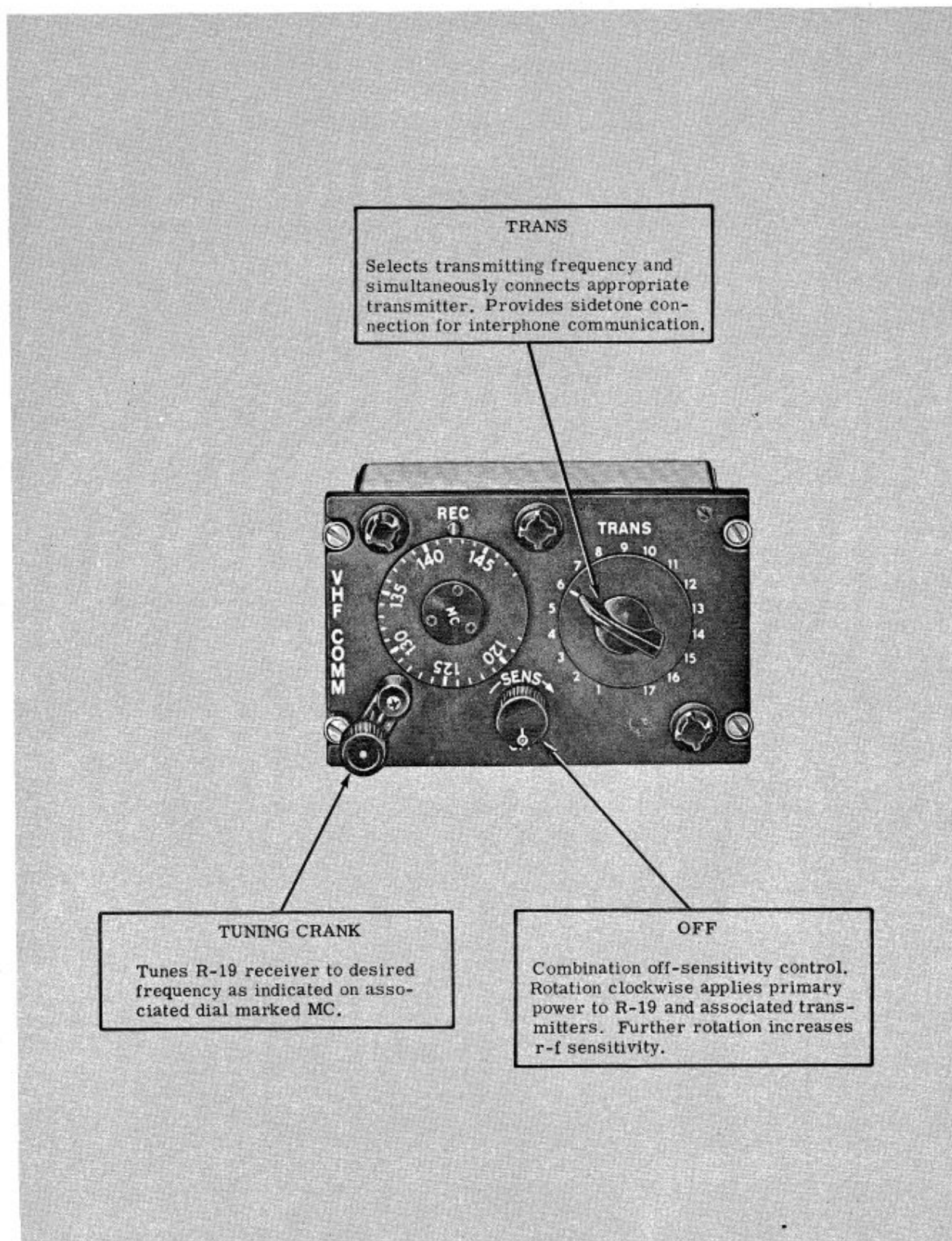


Figure 2-14. Control Unit ARC Type C-49, Location and Function of Operating Controls

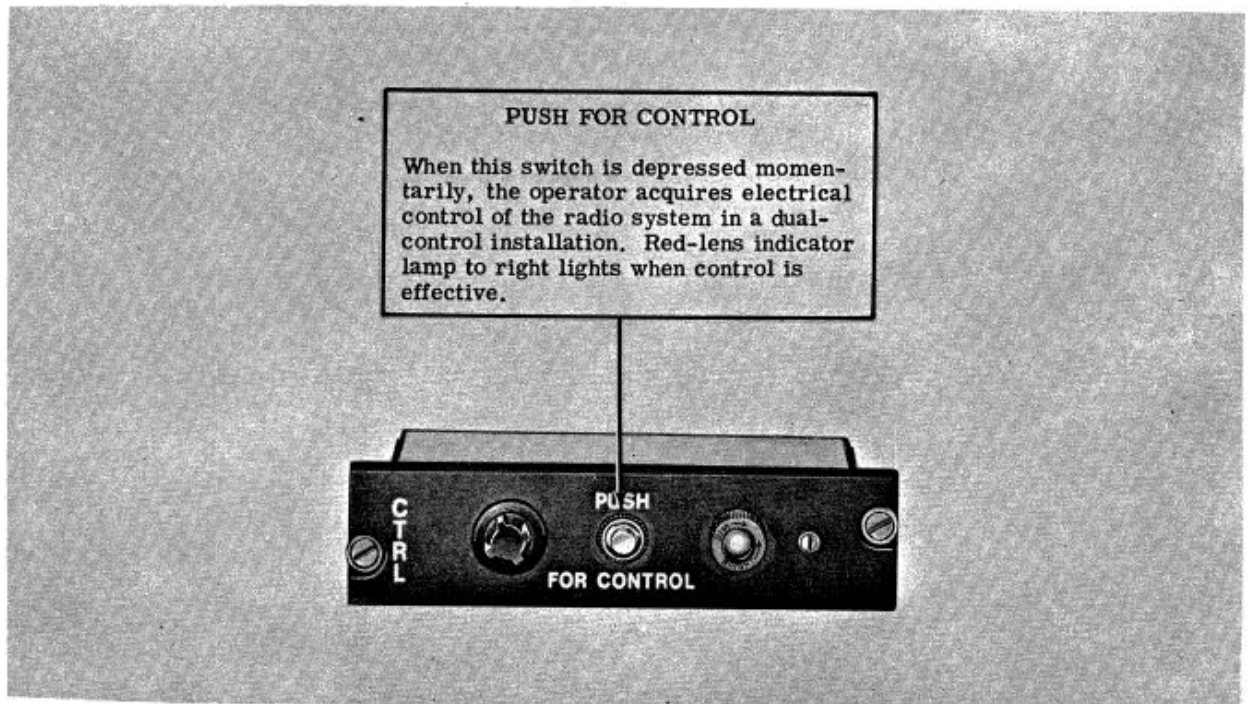


Figure 2-15. Control Unit ARC Type C-50, Location and Function of Operating Control

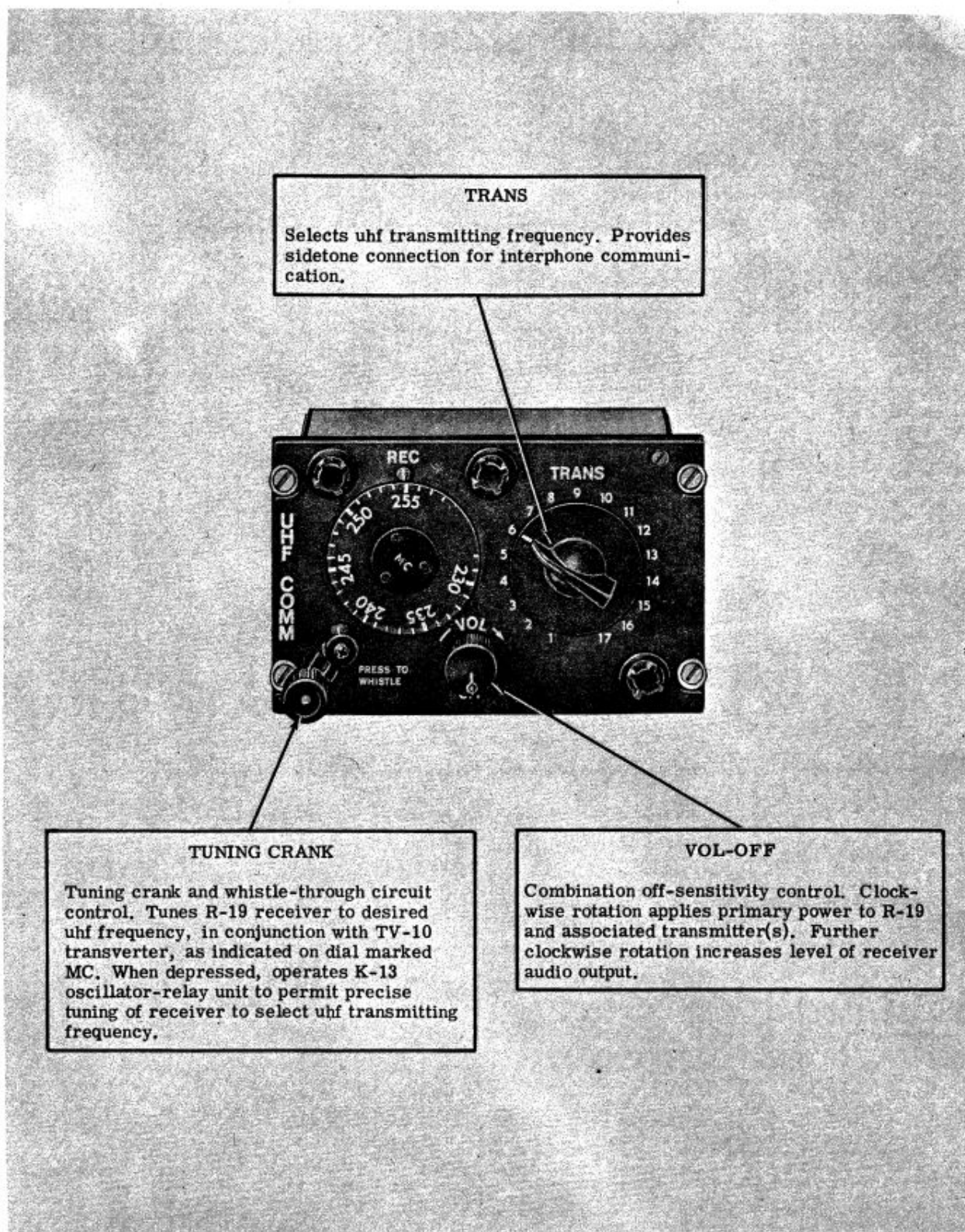


Figure 2-16. Control Unit ARC Type C-52, Location and Function of Operating Controls