1946 1946

INSTRUCTIONS

COLLINS Type 32RA

RADIO TRANSMITTER

MODEL 7

Manufactured By

COLLINS RADIO COMPANY

CEDAR RAPIDS, IOWA, U. S. A.

INSTRUCTIONS

COLLINS Type 32RA

RADIO TRANSMITTER

MODEL 7

Output 75 Watts Radiotelegraph

Output 50 Watts Radiotelephone

Frequency Range

1.5 TO 15.0 MC

Manufactured By

COLLINS RADIO COMPANY

CEDAR RAPIDS, IOWA, U. S. A.

BOOK NO. 248-384

WARNING

OPERATION OF THIS EQUIPMENT INVOLVES THE USE OF HIGH VOLTAGES WHICH ARE DANGEROUS TO LIFE. OPERATING PERSONNEL SHOULD AT ALL TIMES OBSERVE ALL THE SAFETY RULES LISTED BELOW. DO NOT CHANGE TUBES OR MAKE ADJUSTMENTS INSIDE EQUIPMENT WITH HIGH VOLTAGE SUPPLY ON. DO NOT DEPEND UPON DOOR SWITCHES FOR PROTECTION BUT ALWAYS SHUT DOWN POWER EQUIPMENT AND OPEN MAIN SWITCH IN POWER SUPPLY CIRCUIT. ALWAYS DISCHARGE AND GROUND CIRCUITS PRIOR TO TOUCHING THEM.

Since the use of high voltages which are dangerous to human life is necessary to the successful operation of the radio transmitting equipment covered by these instructions, certain precautionary measures must be carefully observed by the operating personnel during the adjustment and operation of the equipment.

KEEP AWAY FROM LIVE CIRCUITS: Under no circumstances should any person reach within a cabinet while power supply line switches to the equipment are closed; or handle any portion of exposed equipment which is supplied with power; or to connect any apparatus external to the cabinets to circuits within the cabinets; or to apply high voltages to the equipment even for testing purposes while any portion of the cabinet is removed. Whenever feasible in testing circuits, make continuity and resistance checks rather than directly checking voltage at various points when any high voltage is applied to the transmitter circuits.

DON'T SERVICE OR ADJUST ALONE: Under no circumstances should any person reach within a cabinet for the purpose of servicing or adjusting the equipment without the presence or assistance of another person capable of rendering aid.

GUARANTEE

This equipment is guaranteed against defects in material, workmanship or manufacture, for a period of one year from the date of delivery. Our obligation under this guarantee is limited to repairing or replacing any item which shall prove, by our examination, to be thus defective, provided the item is returned to the factory for inspection with all transportation charges paid. Before returning any item believed to be of defective material, workmanship or manufacture, a detailed report must be submitted to the company giving exact information as to the nature of the defect. The information shall include, in as much detail as possible, all subject material listed under instructions for replacement of parts. Upon receipt of the report by the company, a returned equipment tag will be forwarded to the shipper without delay. **The returned equipment tag must accompany all shipments of defective parts. No action will be taken on any equipment returned to the company unless the shipment includes the return tag.**

THE COLLINS RADIO COMPANY

REPLACEMENT OF PARTS

In case a replacement under the guarantee is desired, a full report must be submitted to the company. This report shall cover all details of the failure and must include the following information:

(A) Date of delivery of equipment.
(B) Date placed in service.
(C) Number of hours in service.
(D) Part number of item.
(E) Item number (obtain from Parts List or Schematic Diagram).
(F) Type number of unit from which part is removed.
(G) Serial number of unit.
(H) Serial number of the complete equipment.
(I) Nature of failure.
(J) Cause of failure.
(K) Remarks.

When requisitioning replacement parts, the following information must be furnished:

(A) Quantity required.
(B) Part number of item.
(C) Item number (obtain from Parts List or Schematic Diagram).
(D) Type number of unit.
(E) Serial number of unit.
(F) Serial number of equipment.

NOTE: Blank Service Report forms will be found in the appendix of this instruction book.

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I GENERAL CHARACTERISTICS

EQUIPMENT

The Type 32RA Transmitter is completely contained in one unit. The complete installation consists of the transmitter unit, microphone and key. The transmitter components are housed in a cabinet 12″ high, 22″ wide, and 18″ deep. The height is exclusive of mounting feet. The weight of the complete transmitter ready for operation is approximately 120 pounds.

The 32RA Transmitter is designed for table mounting. An area 22″ wide by 18″ deep on the table top is required. At least 2″ clearance at the rear of the transmitter should be allowed for antenna and power connections.

TUBE COMPLEMENT

Tubes are employed as follows in the 32RA Transmitter:

Tube Type No.	Quant.	Circuit Function	Unit Type
6L6G	1	H.F. Oscillator and Multiplier	33K
6L6G	1	Buffer and Multiplier	33K
807	3	Power Amplifier	33K
6C5	1	Audio Input Amplifier	9Z
6L6G	4	Modulator Stage	9Z
80	1	Exciter Power Rectifier	411B
RK60	2	Amplifier and Modulator Power Rectifier	411B

GENERAL DESCRIPTION

The Type 32RA Equipment is a low power, general purpose radiotelephone and radiotelegraph transmitter. It is especially applicable in services where up to four frequency channels must be quickly available.

The transmitter cabinet is of the console type, suitable for table mounting. Ventilating louvers are provided in the top, back, and two sides, assuring adequate ventilation for all heat producing elements. The construction is of heavy gauge, electrically welded sheet steel with a durable gray crinkle finish outside and a flat gray enamel finish inside.

The components of the transmitter are so arranged that unit construction is possible and are broken down into four units as follows:

101L Panel and Cable Assembly
33K Radio Frequency Unit
9Z Speech Amplifier and Modulator
411B Power Supply

All wiring is entirely independent of the cabinet and all units may readily be removed from the cabinet for inspection or replacement.

TYPE OF EMISSION

A1 telegraph and A3 telephone emission are available with the 32RA Transmitter. Keying of the carrier for telegraph operation is accomplished by interruption of the cathode circuit of the buffer and final amplifier stages. Keying speeds up to 60 words per minute may be employed. The audio frequency response of the transmitter in telephone operation is uniform within plus or minus 2 db from 200 to 4000 cycles per second and the audio frequency amplitude distortion is less than 5% r.m.s. total harmonics at any modulation level. The residual noise level is more than 50 db below 100% modulation.

FREQUENCY RANGE

The frequency range of the 32RA Transmitter is normally 1.5 mc. to 15 mc. The equipment is designed to work into unbalanced antennas or transmission lines having an impedance of 30 to 1200 ohms resistive and up to 300 ohms reactive.

FREQUENCY CHANGE METHOD

Four separate and unrelated frequencies within the range 1.5 to 15 mc. may be set up. Any one of the four frequencies may be selected instantaneously by means of a single rotary switch. No retuning of any circuit is required when changing from one frequency to another. The oscillator may be either crystal controlled or self-excited depending upon the use of crystals or plug-in master oscillator tuning units. All tuning elements are of the plug-in type and may be changed at will. Tuning controls are located inside the cabinet and require the use of an insulated screw driver for making adjustments.

POWER OUTPUT

The nominal rated power output of the 32RA Transmitter is 50 watts radiotelephone and 75

watts radiotelegraph delivered into a 70 ohm artificial load at any frequency within the specified range. The transmitter is capable of 100% modulation for telephone operation.

POWER SOURCE AND INPUT REQUIREMENTS

The 32RA Transmitter is designed to operate from a 115 volt, single phase, 50/60 cycle, a-c power source. The maximum input power requirement is 390 watts at 0.9 power factor.

CONTROLS

A simplified system of control is employed in the 32RA Transmitter. Two heavy duty toggle switches control the filament and plate power circuits. The switches are so interlocked that the plate power cannot be turned on until after the filament power switch has been operated. A press-to-talk button associated with the microphone may be used to turn on the plate power instead of the plate power switch when transmissions of short duration are contemplated. A selector switch provides for the application of plate power to successive r-f stages as well as the selection of proper circuits for telephone or telegraph emission.

ACCESSORIES

A single button carbon microphone and a telegraph key are the only required accessories for use with the 32RA Transmitter.

II INSTALLATION

UNCRATING

Open packing cases with care. When cases are marked with arrows to indicate upright position, remove covers of cases only and lift units out carefully. Search all packing material for small packages. Remove wrapping from equipment and blow or lightly brush away packing dust and shavings. In case of damage, file all claims promptly with the transportation company. It is necessary to preserve the original packing box and packing material in case a claim is to be filed with the transportation company.

INSPECTION

Inspect cables and wiring for possible broken or displaced wires. Make sure that all terminal connections are tight. Inspect each unit for loose screws or bolts. Make certain all controls such as switches, dials, etc., operate properly.

PLACING TRANSMITTER

The console type cabinet is designed to be placed on the operating table along with the receiving apparatus. It occupies a space 22″ wide by 18″ deep. At least two inches should be allowed at the rear for making antenna and power input connections. Sufficient clearance at the sides should be provided for free circulation of air.

FUSES

All fuses should be examined and their ratings checked. Correct fuse positions are shown in the top view photograph of the transmitter. The fuses employed in this equipment with corresponding parts list item numbers are tabulated below:

Fuse Item Number	Circuit	Fuse Rating
416	A.C. Power Line Fuse	10 Amp.
417	H.V. Primary Fuse	6 Amp.
418	L.V. & Bias Primary Fuse	3 Amp.

EXTERNAL CONNECTIONS

Place all power switches in the OFF position before attempting to make any external connections. The external connections for the 32RA Transmitter are as follows:

1. A. C. Power Line
2. Microphone and Key
3. Radiation System

Power Line

The 32RA Transmitter is designed to operate from a 115 volt, single phase, 50/60 cycle power source. The supply line should be checked for these specifications before connections are made. The maximum power required from the line by this equipment is 390 watts. The power line is connected to the transmitter by means of a convenience cord supplied with the equipment. One end of the cord is plugged into the flush receptacle on the transmitter and the other end is placed in a standard outlet.

Microphone and Key

The microphone plug is inserted in the receptacle Item No. 110 on the front of the transmitter. It is very important, in order to avoid radio frequency feedback problems, to make sure the clamping ring on the microphone plug is tightly turned up on the threads around the input receptacle. Push-to-talk control connections are made as a part of the microphone circuit connections.

The telegraph key is plugged into the key jack, Item 111 on the panel.

Radiation System

The 32RA Transmitter has been designed for the use of an unbalanced antenna system on all frequencies. All antenna and ground connections for the radiation system are made to insulated terminals on the rear of the cabinet. These terminals are arranged so that either four separate antennas may be used for the four different frequencies or the terminals may be connected together and a single antenna used on all frequencies. A good, low resistance ground should be connected to the ground terminal.

III PRELIMINARY ADJUSTMENT

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PRELIMINARY

Be certain the filament and plate power switches are in the OFF position. Turn the AUDIO GAIN to the full off (counterclockwise) position. Place the SELECTOR switch in the 0 position.

TUBES

Each of the units requires tubes in accordance with the list shown on page one. Each tube position is engraved with the proper tube type designation. All tubes may now be inserted, using the engravings and the top view photograph as a guide. When placing plate leads on the plate cap connections of tubes, use care so as to avoid putting any mechanical strain on the glass envelope.

COILS

Although the 32RA has been designated as a four channel transmitter with rapid frequency changing facilities, plug-in coils are used so that it is possible to place any channel on any frequency in the service range.

The plug-in coil unit employed in the oscillator and first amplifier stages on each frequency channel consists of one or two tank coils and two variable condensers mounted within an aluminum shield 2"x2"x4½". The windings are placed upon a ceramic form fitted with pins to match a medium seven-prong socket.

The coil units employed in the exciter stages on frequencies from 1.5 to 9 mc are constructed with one tank coil only. This coil is tapped to provide two frequency ranges which may be selected as desired by placing the knurled screw at the top of the coil can in the proper position. The frequency ranges covered by the tank circuit are designated on the coil nameplate as "Range A" and "Range B". The tank condenser designated "Tuning" is employed as the frequency multiplier plate tank circuit. The other variable condenser is employed as the excitation control for the power amplifier stage.

The coil units employed in the exciter stages on frequencies from 9 to 15 mc are provided with two tank coils, one of which is used as the oscillator plate tank circuit and the other as the frequency multiplier plate tank circuit. These coils are designed to cover a single frequency range.

The coil units intended for use in the final amplifier consist of a single coil wound upon a threaded ceramic form. A coil contact device is provided so that the exact value of inductance required may be obtained. These units are designated 190F for the frequency range 1.5 mc to 4.0 mc, and 190E for the frequency range 4.0 mc to 15 mc.

The positions of the various plug-in coil units are shown in the top view photograph of the transmitter. Each coil position is designated with the number of the frequency channel corresponding to the position of the frequency selector tap switch. When the 7000C coil units are put in place, the operating frequency of each stage must be kept in mind. For instance, crystals above 4500 kc are not used. Therefore, the crystal frequency must be doubled once in order to operate on frequencies between 4500 and 9000 kc and twice in order to operate on frequencies between 9000 kc and 15,000 kc. When the oscillator frequency is doubled only once, this takes place in the buffer stage. When the oscillator frequency must be doubled twice, it is performed first in the oscillator plate circuit, and again in the buffer stage. The 190 series coils for the final amplifier are plugged into the general purpose jack on the output receptacle plate as shown in the photograph.

Crystals

The crystal sockets are shown in the top view photograph of the transmitter. Each crystal position is designated to correspond with one of the four FREQUENCY switch channel positions. Crystals mounted in type 1C holders are recommended. These holders are of the sealed, fixed airgap type.

PRELIMINARY ADJUSTMENT

Master Oscillator Coils

When it is desired to operate the 32RA Transmitter with a self-controlled master oscillator circuit, it is necessary to place a type 145J Master Oscillator Frequency Control Unit in the crystal socket corresponding to the FREQUENCY control switch position. This frequency control unit consists of a low loss tank coil with a fixed tuning capacity forming a high Q tank circuit which serves in place of the quartz crystal. The frequency of operation of this tank circuit may be varied over a frequency range of approximately 1.25 to 1 by means of an adjustable core. The position of this core may be adjusted by means of a micrometer screw protruding from the top of the unit.

General

A coil tuning data chart is shown on page 18a to assist the operator in selecting the proper exciter coil unit and master oscillator frequency control unit. This chart indicates the proper model of the 145J Coil Unit to employ when operation on the higher frequency bands is required. The tuning range of the general coverage coil units is also indicated. Curves for both "Range A" and "Range B" coverage are given.

It should be pointed out at this time that when coils are supplied for a general frequency coverage, standard units are furnished which will match the curves shown. When coils are supplied for a special spot frequency, a unit is supplied such that the operating frequency appears near the center of the tuning range. In this case, the exact operating frequency is specified on the coil name plate.

RADIO FREQUENCY CIRCUIT ADJUSTMENT

In general, when complete sets of coils are supplied for one or more channels and the frequency is specified, the coils will be shipped from the factory pre-tuned except for the power amplifier coil. The exciter coil unit should not require adjustment. However, when a set of coils is supplied for a general tuning range and no specified frequency is ordered, it will be necessary to adjust each tuning control beginning with the oscillator. When retuning of the exciter stages is required, the following procedure should be followed.

Exciter Circuit

Place the FREQUENCY switch in the channel position required for the particular frequency to be used. This will depend upon the placement of the crystals and coils in the transmitter. Place the SELECTOR switch in the zero position. Remove the key and microphone plugs from the receptacles on the panel. Place the filament power switch in the ON position and allow the transmitter tube filaments to warm up for a period of thirty seconds. Place the plate power switch in the ON position. Place the SELECTOR switch in the B position. With the EXCITATION tuning control on the top of the exciter coil unit placed at approximately midscale, adjust the TUNING control, corresponding to the frequency channel employed, to resonance as is indicated by a reading on the grid current meter. A dip on the exciter plate current meter should be observed at the same time the grid current meter shows a reading. Adjust the EXCITATION control for proper grid current to the final amplifier. This grid current should be 8 to 10 ma. Readjust the TUNING control for resonance as indicated by maximum grid current to the final amplifier.

CAUTION: Never change the position of the SELECTOR switch or FREQUENCY switch without placing the plate power switch in the OFF position. Caution should be observed in making internal adjustments with the plate power on. It is suggested that the plate power be turned off while making any internal adjustments unless such adjustments are made with an insulated screw driver.

Master Oscillator Adjustment

In adjusting the master oscillator circuit, the selector switch is placed in the zero position and the plate power turned on. The master oscillator frequency control knob is adjusted until the desired frequency is indicated in a radio frequency monitor which must be used to determine the output frequency of the transmitter. When operation is required on frequencies higher than 3750 kc, it is necessary to double or quadruple the frequency of the master oscillator circuit. This feature should be kept in mind while adjusting the frequency of the master oscillator circuit.

PRELIMINARY ADJUSTMENT

After the master oscillator frequency has been adjusted to the proper value, the exciter tuning procedure described above may be followed.

Adjustment of the Final Amplifier

It is recommended that a preliminary test of the final amplifier be made, using a 60 watt 110 volt electric light bulb as an artificial antenna. A jumper may be connected between the antenna terminals, and the lamp connected between this jumper and ground. This procedure will aid the operator in familiarizing himself with the proper adjustment of the transmitter without radiating an appreciable signal. Reference to the general transmitter test data sheet will indicate results obtained when using a lamp loading of the specified type. Note that the test data shows the current for each stage, while the excitation plate meter indicates total plate current to the oscillator and buffer stages.

Set the rider on the final amplifier coil to the required number of turns for the particular operating frequency as shown in the test data. Adjust the final amplifier plate tuning condenser to about 50% capacity. Adjust the corresponding antenna tuning condenser to maximum capacity.

Advance the selector switch to position T. In this position plate power is applied to the final amplifier through a 2000 ohm current limiting resistor for tuning purposes.

Place the plate power switch in the ON position and adjust the corresponding final amplifier plate tuning condenser to resonance as is indicated by a minimum final amplifier plate current reading. Also adjust to the exact minimum plate current as the system is operating under conditions of maximum efficiency at this point.

If the plate current is greater than 80 to 100 ma., it should be reduced by adding more turns to the final amplifier coil by adjusting the rider. The final amplifier plate condenser should then be retuned to resonance. This procedure should be followed until a plate current reading between 80 and 100 ma. is obtained.

If the final amplifier plate current is less than 80 to 100 ma., it may be increased by reducing the capacity of the antenna tuning condenser. Always retune the final amplifier tuning condenser to resonance after each change in the setting of the antenna tuning condenser.

If the final amplifier plate current cannot be raised to a value between 80 and 100 ma., retune the antenna tuning condenser to maximum capacity, then decrease the number of turns in the final amplifier coil. After this, again reduce the capacity of the antenna tuning condenser and adjust the final amplifier tuning condenser to resonance.

Return the plate power switch to the OFF position and advance the SELECTOR switch to the CW position. In this position full voltage is applied to the plate circuit of the final amplifier and maximum power output should be obtained.

Place the power switch in the ON position and adjust the antenna tuning condenser and retune the final amplifier plate condenser until a final amplifier plate current reading of 300 ma. is obtained.

In cases where operation is desired on frequencies at the low frequency end of the operating range, it may happen that the capacity of the input condenser of the network may not be great enough for proper tuning. In this case bridging condensers are supplied. Each may be plugged into receptacles in such a manner that the bridging condenser will parallel the input network condenser, providing the additional capacity required.

The transmitter is now operating under full load conditions and a lamp employed as an artificial antenna should attain full brilliance. The transmitter may now be keyed by inserting the key cord plug into the key receptacle on the panel. Turn off the plate power switch.

For phone operation, plug the microphone cord into the receptacle on the front of the panel and place the SELECTOR switch in the PH position. Place the switch on the modulator unit in the MOD. position. The transmitter may now be turned on by pressing the push-to-talk button associated with the microphone. The audio gain control should be rotated clockwise until when a steady tone signal is impressed on the microphone the plate voltmeter reads up to the red line at 400 volts. This corresponds to 100% modulation. When the voltmeter switch is placed in the MOD. position, the voltmeter may be used as a modulation indicator. The red line at 400 volts indicates 100% modulation, 200 volts is 50% modulation, etc. The modulation indicator has the limitations common to all pointer type level indicators, in that it shows the average level of modulation only and its calibra-

tion is numerically correct only for pure tone inputs. Voice modulation consists of complex wave forms which invariably contain peaks of considerable amplitude. Consequently the transmitter will be completely modulated at voice inputs when the modulation indicator reads between 30 and 50% modulation. The audio gain control should be adjusted with these factors in mind.

The transmitter may now be connected to the operating antennas. Should four unbalanced antennas be used they may be connected to terminals 1, 2, 3, and 4 on the back of the transmitter cabinet. Place the selector switch in the T position and proceed with the final amplifier tuning adjustments as described above. For routine operation the plate current loading to the final amplifier should be adjusted to 300 ma. for CW operation and 225 ma. for Phone operation.

When this procedure is completed and the various circuits checked for exact resonance, the same procedure may be followed for tuning the transmitter on the other frequency channels.

After the transmitter has been tuned up on all frequencies, changing from one frequency to another will merely involve the rotation of the FREQUENCY selector switch to the desired frequency channel position. This operation should also be performed with the plate power turned off.

IV CIRCUIT DESCRIPTION

CONTROL CIRCUITS

The transmitter power circuits are controlled from the front panel by means of two switches. When both switches are in the OFF position, all power circuits are open. When the filament switch is on, power for heating all filaments is supplied. When the Plate switch is in the ON position, the transformers supplying the high voltages are energized. The switches are interlocked so that the high voltage cannot be turned on unless the filament switch is in the ON position. A push-to-talk button associated with the microphone may be used to turn on the plate power of the transmitter instead of the plate switch when transmissions of short duration are contemplated. When this is desired, it is necessary to place the plate power switch in the OFF position. A selector switch provides for application of plate power to successive r-f stages as well as the selection of the proper circuits for Phone or CW emission. Provision is made for application of the plate voltage to the final amplifier through a dropping resistor to facilitate tuning.

KEYING CIRCUIT

Keying is accomplished in the 32 Series Transmitters by interruption of the cathode circuit of the buffer and final amplifier tubes.

CHANNEL SELECTOR SYSTEM

Four frequency channels are available in the 32RA Transmitter. The tuning elements on each channel are made up of individual, pre-tuned tank circuits. These elements are of the plug-in type and may be readily changed. Channel selection is obtained by means of the FREQUENCY switch, which selects the required group of tuned elements for the frequency desired.

POWER SUPPLY

This transmitter contains two complete rectifier and filter circuits. One circuit employs a type 80 rectifier tube and furnishes approximately 400 volts plate power to the crystal oscillator, buffer amplifier, and speech amplifier stages. The main power circuit employs two RK-60 rectifier tubes and supplies 500 volts at 450 ma. to the plate circuits of the final amplifier and modulator stages. Both power supplies employ full wave rectifier connections with two section choke input filters. The circuits are separately fused and so interlocked that no damage can result in the event an overload occurs on either.

AUDIO SYSTEM

A single speech amplifier-modulator unit is employed in the 32RA Transmitter. The input consists of a single 6C5 tube and microphone transformer designed to be used with a single button carbon microphone. This stage drives the Class AB modulator stage. The modulator stage consists of four 6L6G tubes operating in a push-pull-parallel circuit. The modulator stage modulates the Class C r-f amplifier directly.

Microphone current for the single button carbon microphone is obtained from bridging resistors in the cathode circuit of the modulator stage. An audio gain control adjusts the input level to the 6C5 tube grid circuit. The input stage employs cathode bias. This stage is transformer coupled to the modulators. The modulator bias is obtained from a cathode resistor. A push-to-talk button associated with the microphone operates a relay in the power supply which automatically turns on the plate power of the transmitter for push-to-talk operation.

RADIO FREQUENCY SECTION

Oscillator

The 32RA Transmitter employs a beam power type oscillator tube which is controlled by a low temperature co-efficient quartz crystal, providing an oscillator having high frequency stability. The oscillator is designed so that power output may be obtained on the harmonic frequencies as well as the fundamental frequency of the crystal. The control grid and the screen grid of the tube together with the cathode constitute the primary oscillator circuit which is allowed to oscillate at all times voltage is applied to the screen grid. The primary oscillator circuit is coupled to the plate circuit by means of the electron stream. This circuit feature performs an isolation function, thus providing further stabilization of the signal.

Buffer Amplifier

This stage employs a 6L6G beam power tube and is operated both as an intermediate amplifier and a frequency multiplier. The grid circuit is capacitatively coupled to the plate circuit of the oscillator tube and employs a combination of cathode resistor and grid leak bias. Cathode bias prevents excessive plate current should the excitation fail. Approximately 400 volts is applied to the plate of the tube. Screen potential is obtained by means of a dropping resistor in series with the plate voltage.

Final Amplifier

The final radio frequency amplifier employs three type 807 tubes operating in a parallel circuit. These tubes are operated as plate modulated Class C amplifiers. A combination of fixed and grid leak bias is employed. Approximately 500 volts d.c. is applied to the plates of the tubes. Screen potential is obtained by means of a resistor in series with the plate voltage.

Radio Frequency Output Circuit

The output circuit consists of a pi network capable of operating into an unbalanced antenna or transmission line. Use of this type of output network greatly simplifies the tuning procedure. As this network is a low pass filter, harmonic attenuation is attained. The elements of the pi network are of such value that a large range of impedances may be matched. The output coils are provided with a coil tapping device which permits the choice of the number of turns at will. The input condenser of the network is provided with a pair of jacks so that a bridging condenser may be installed for operation on the lower frequencies when the capacity range of the variable condenser proves insufficient.

V MAINTENANCE

This radio equipment is constructed of materials considered to be the best obtainable for the purpose, and has been carefully inspected and adjusted using accurate test equipment. No one but an authorized and competent service man equipped with proper test facilities should be permitted to service this equipment.

ROUTINE INSPECTION

Routine inspection schedules should be set up for periodic checks of this equipment. This inspection should include examination of the mechanical system for excessive wear or binding and of the electrical system for electrical defects. Make a check of emission characteristics of all tubes. After the emission check, examine the prongs on all tubes to make sure that they are free from corrosion. See that all tubes are replaced correctly and fully in their sockets, and that good electrical contact is made between the prong of the tube and the socket. Check all relays for proper operation and inspect relay contacts to make certain that the contact surfaces are clean and free from pits and projections. Make certain that contacts of all receptacles and plugs such as microphone, key and cable connectors are clean and that these make firm mechanical connection between one another.

If the routine inspection of the equipment is carried out faithfully, the chances of improper operation of the equipment are greatly minimized. It is, therefore, important that this inspection be made as frequently as possible and it should be sufficiently thorough to include all major electrical circuits of the equipment as well as the mechanical portion.

CLEANING

The greatest enemy to uninterrupted service in equipment of this type is corrosion and dirt. Corrosion itself is accelerated by the presence of dust and moisture on the component parts of the assembly. It is impossible to keep moisture out of the equipment in certain localities, but foreign particles and dust can be periodically removed by means of a soft brush and a dry, oil-free jet of air. Remove the dust as often as a perceptible quantity accumulates in any part of the equipment. It is very important that rotating equipment such as variable condensers and tap switches be kept free from dust to prevent undue wear. Likewise, variable condenser plates should be kept free from dirt to avoid flashover on modulation peaks.

RELAYS

In general the contact adjustment of the a-c type relay is not critical. Spare contacts and spare coils can be obtained and replacement made when necessary. Never use an abrasive on the contact surfaces. Relays which have excessive hum are usually not seating properly. Dirt on the pole faces is the most likely cause of this and may be removed by washing with gasoline.

FUSES

This equipment is supplied with fuses of correct rating in each position. Fuse failures should be replaced with spares only after the circuit in question has been carefully examined to make certain that no permanent fault exists. Always replace a fuse with the rating as specified in the table on page 15.

CRYSTALS

The low frequency-temperature coefficient quartz crystals as supplied in Collins transmitters are extremely active and rugged. They should require little or no attention over long periods of time. The type 1 series crystal holders are sealed against moisture and dirt and should not be opened unless all tests of the oscillator circuit point to erratic condition in the crystal.

If required, the crystal and electrodes may be cleaned with carbon tetrachloride and a soft cloth. After reassembling the holder and before resealing with duco cement in the case of type 1 series holder, the holder with crystal in position should be heated to drive out any excess moisture. The temperature in the heating process should not exceed 60 degrees C.

It is recommended that crystals should not be examined unless a fault develops, since frequent cleanings and handling will in time change the frequency.

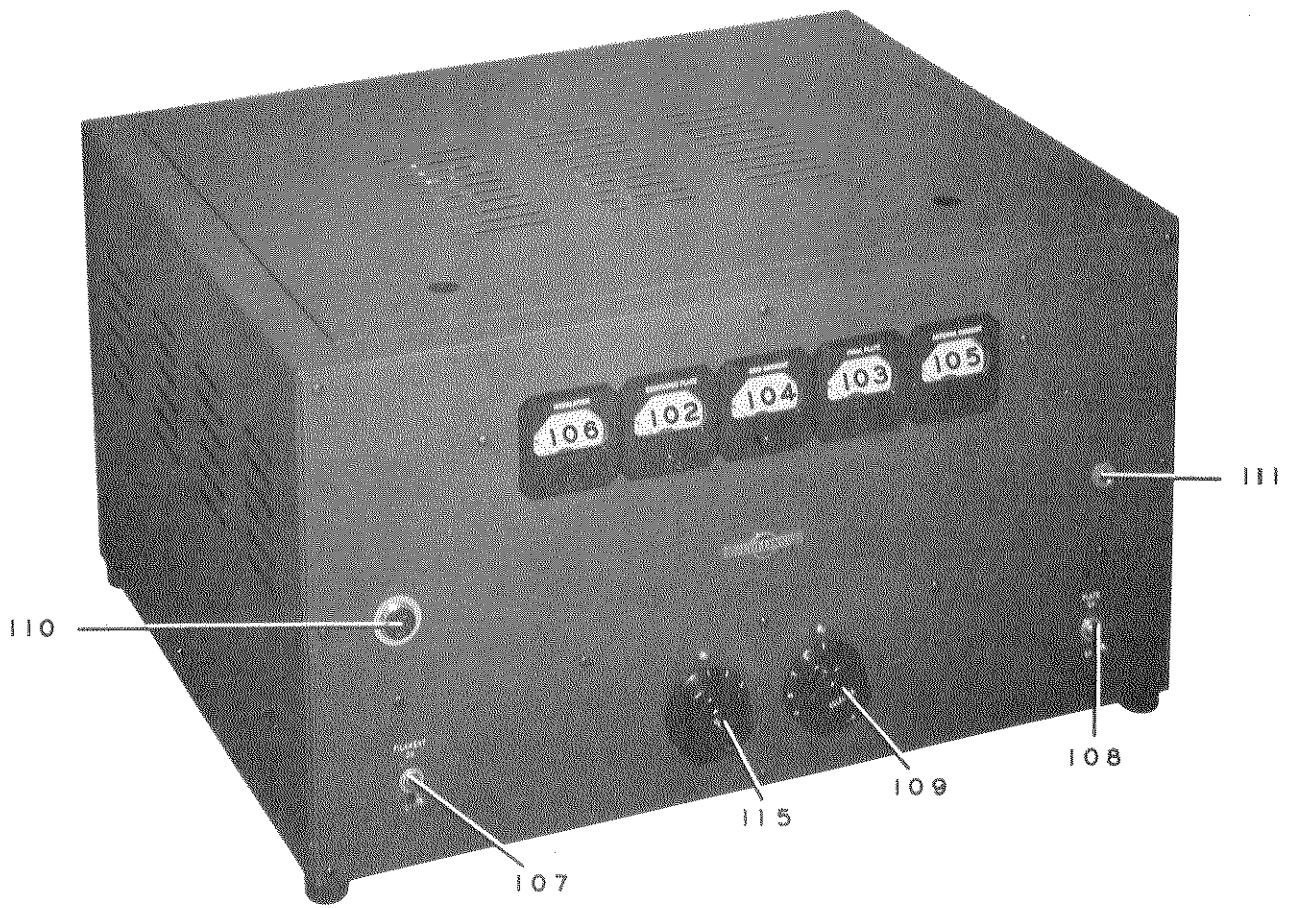


FIG. 1 32RA TRANSMITTER

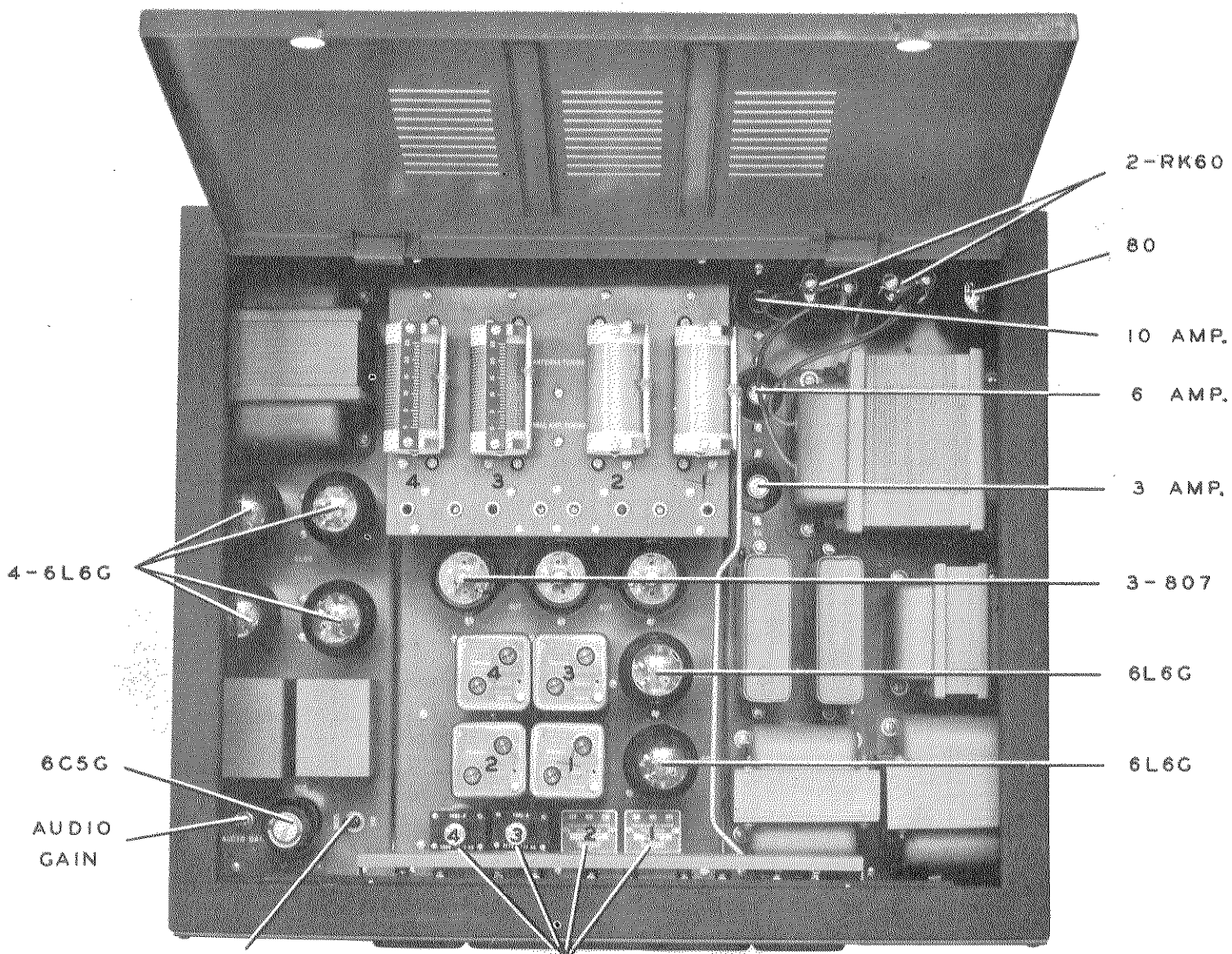


FIG. 2 32RA TRANSMITTER

TOP VIEW

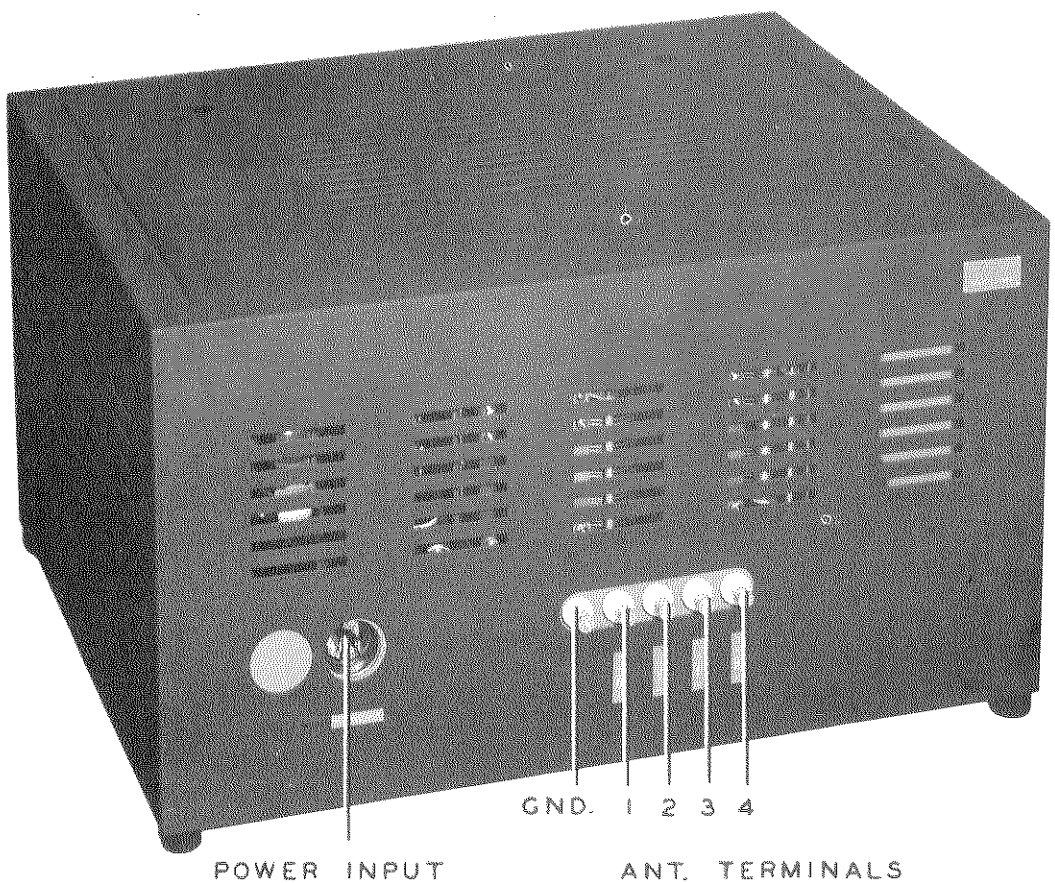


FIG. 3 32RA TRANSMITTER

REAR VIEW

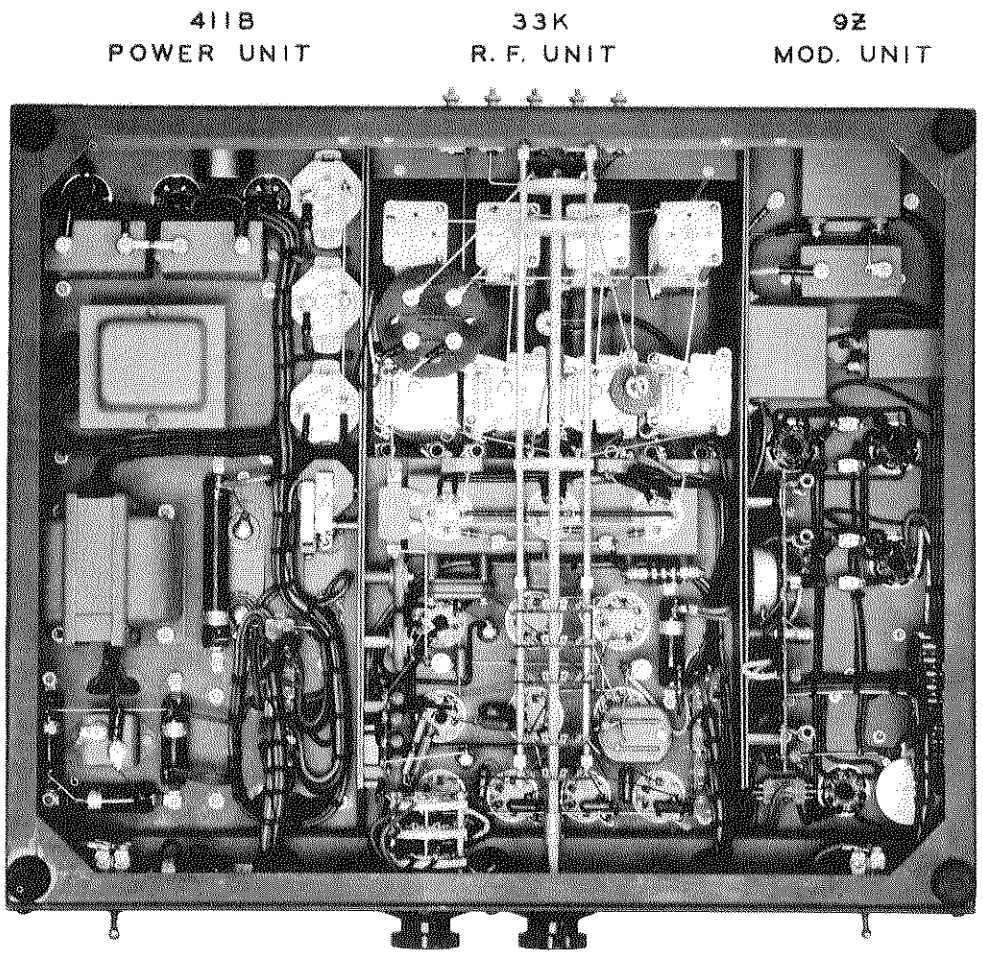


FIG. 4 32RA TRANSMITTER
BOTTOM VIEW

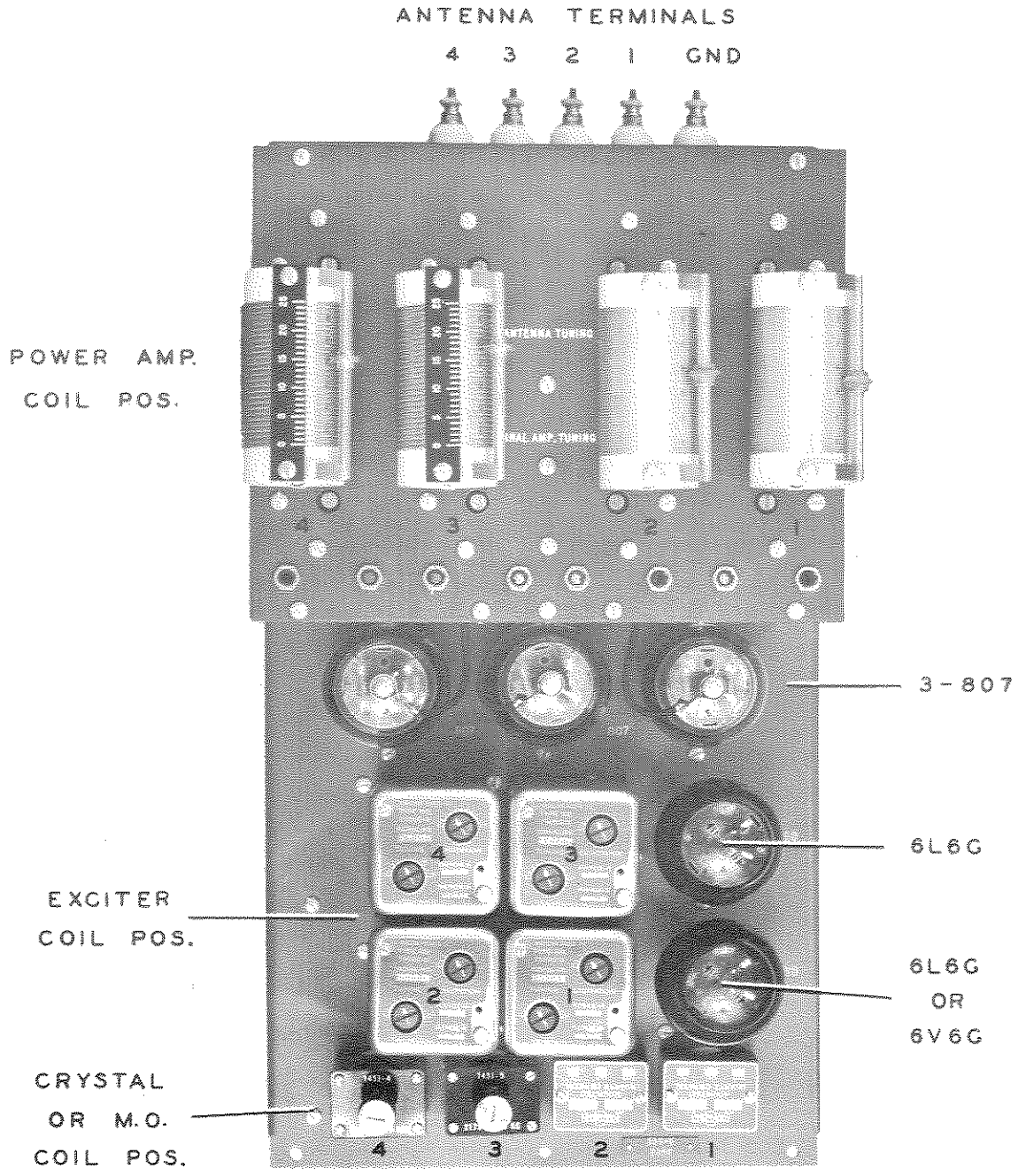
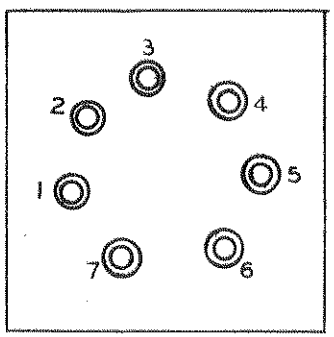


FIG. 5 33K R-F UNIT
TOP VIEW

MAT.:	GRADE:	DRAWN BY: WFS	DATE:	COLLINS RADIO COMPANY
FINISH:		TRACED BY: MRJ	DATE: 1-29-41	CEDAR RAPIDS, IOWA
		CHECKED BY: WFS	DATE: 3-26-41	
UNIT: SCHEMATIC: 7000C-5 TUNING COIL ASSEMBLY			SCALE	DRAWING NO 102A-1

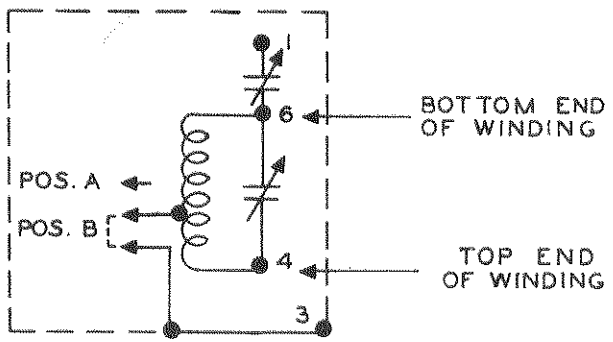
D145A



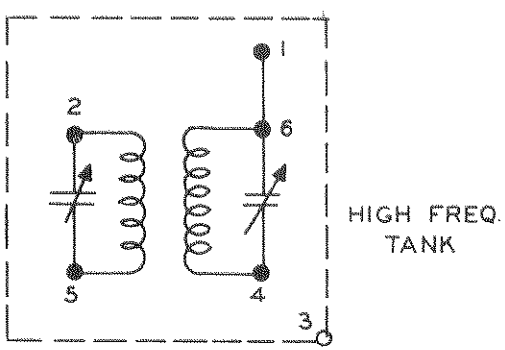
BOTTOM VIEW

COIL FORM BASE

1.5 TO 9.0 MC



9.0 TO 1.5 MC



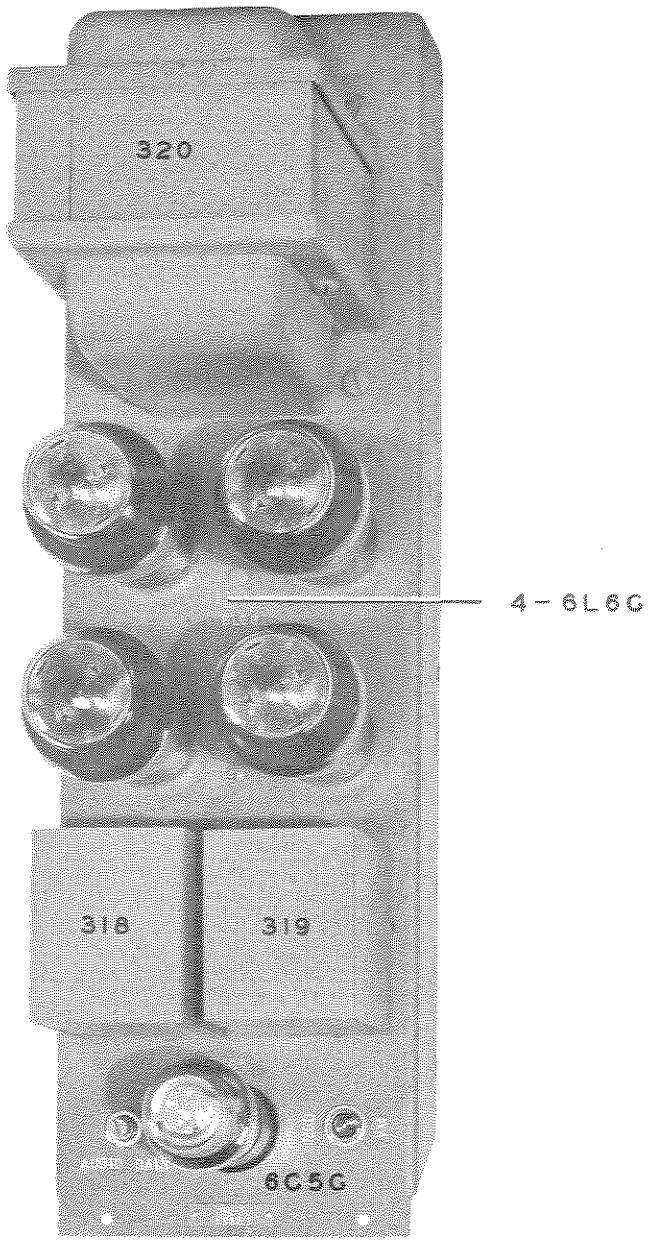


FIG. 7 9Z MODULATOR UNIT

TOP VIEW

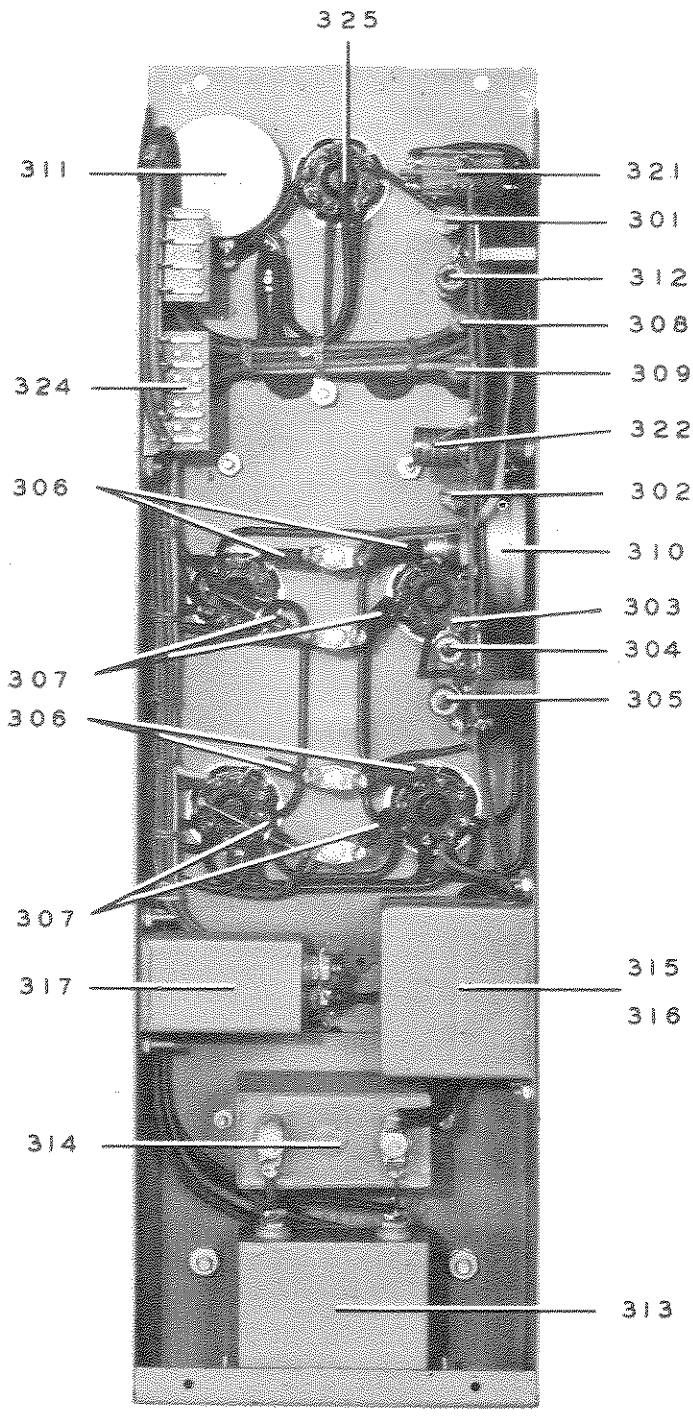


FIG. 8 9Z MODULATOR UNIT

BOTTOM VIEW

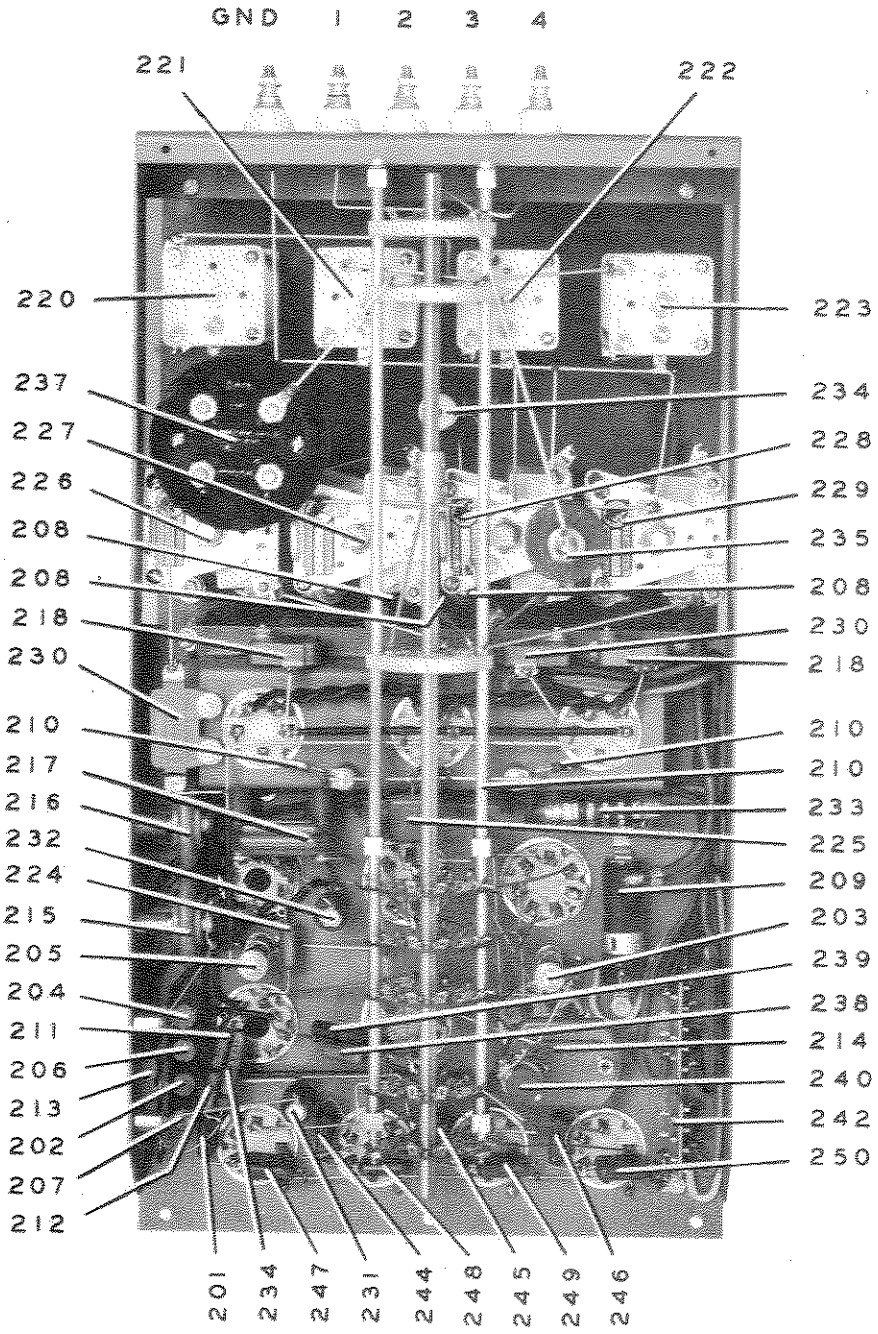


FIG. 6 33K R-F UNIT

BOTTOM VIEW

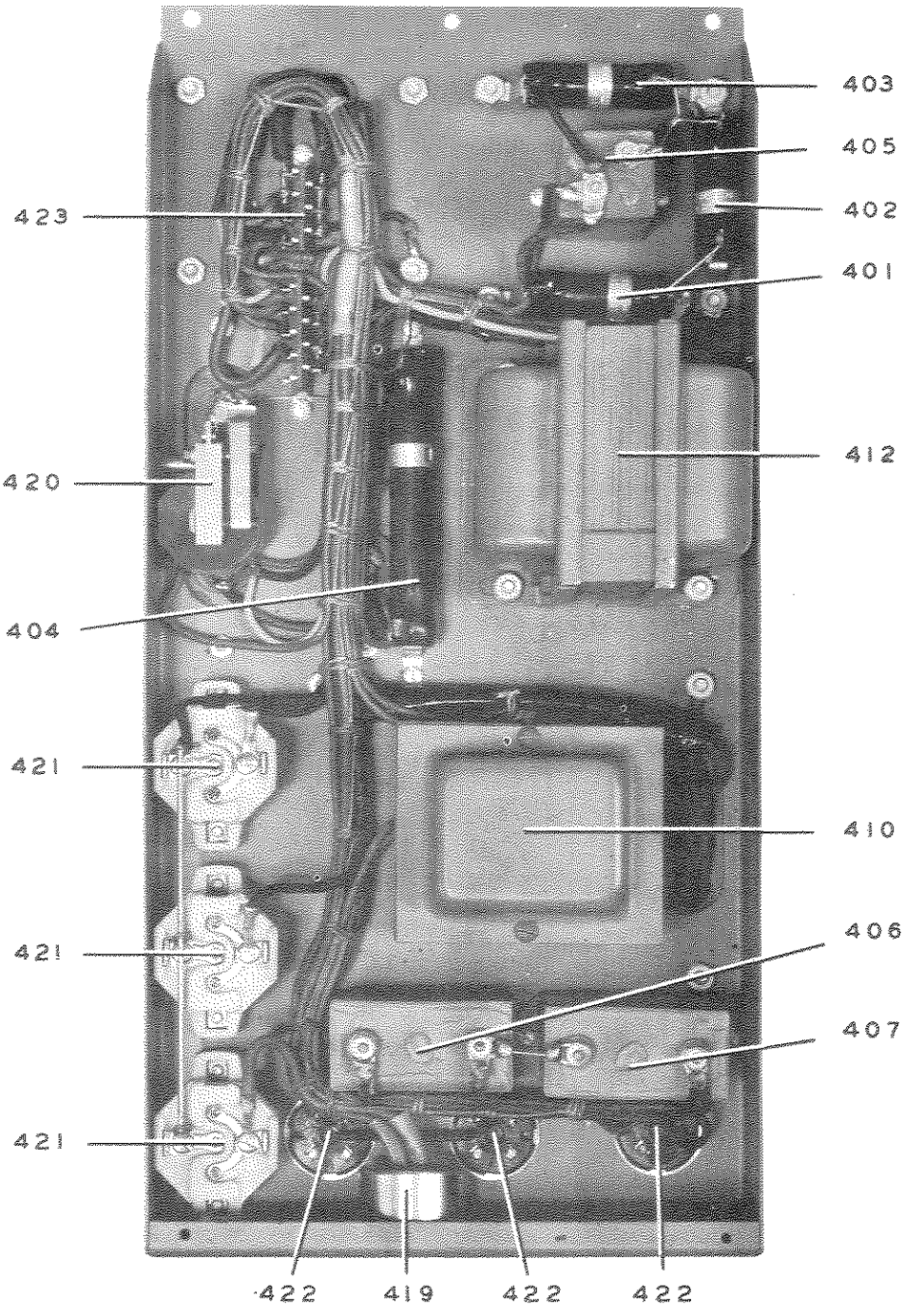


FIG. 10 411B POWER UNIT

BOTTOM VIEW

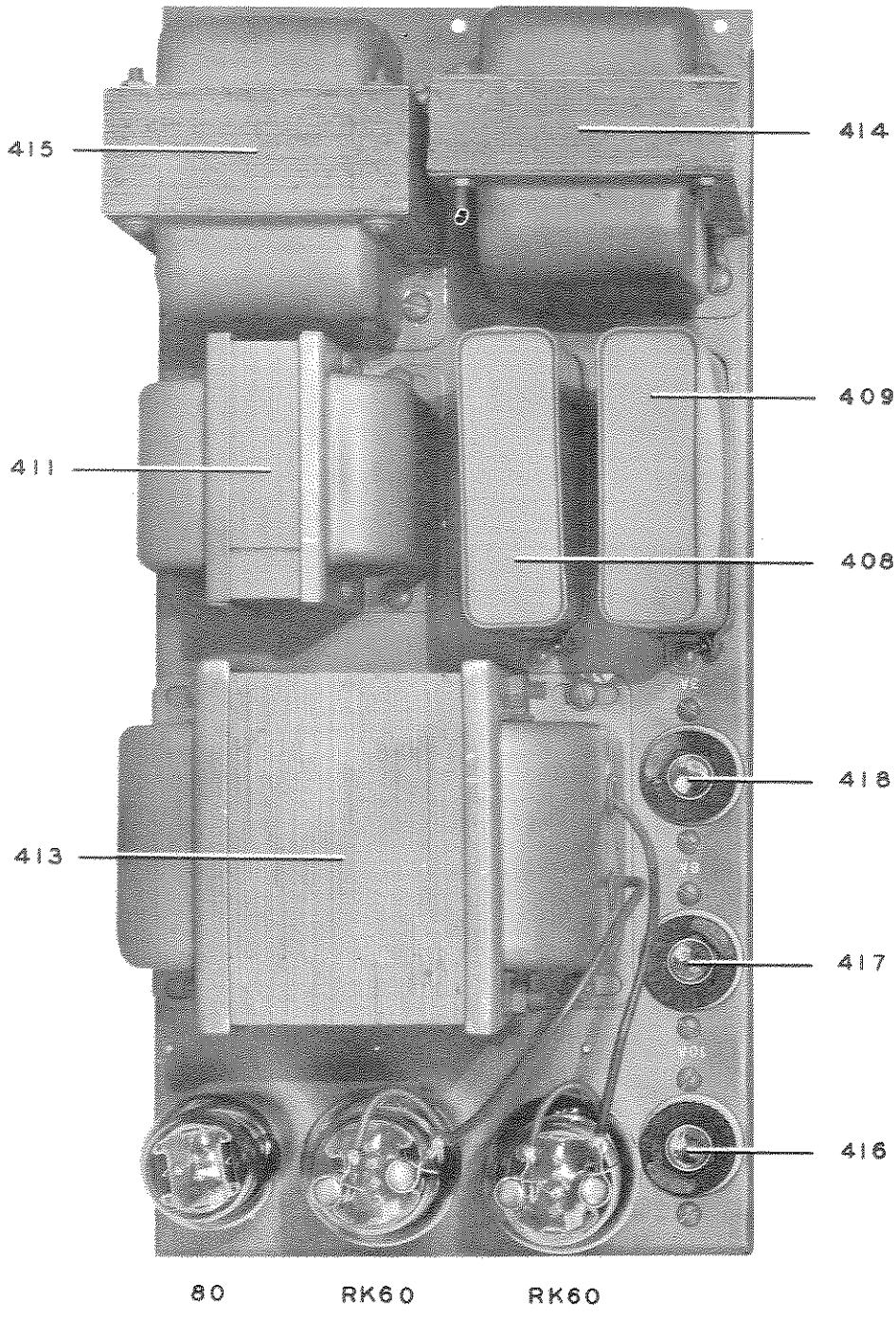
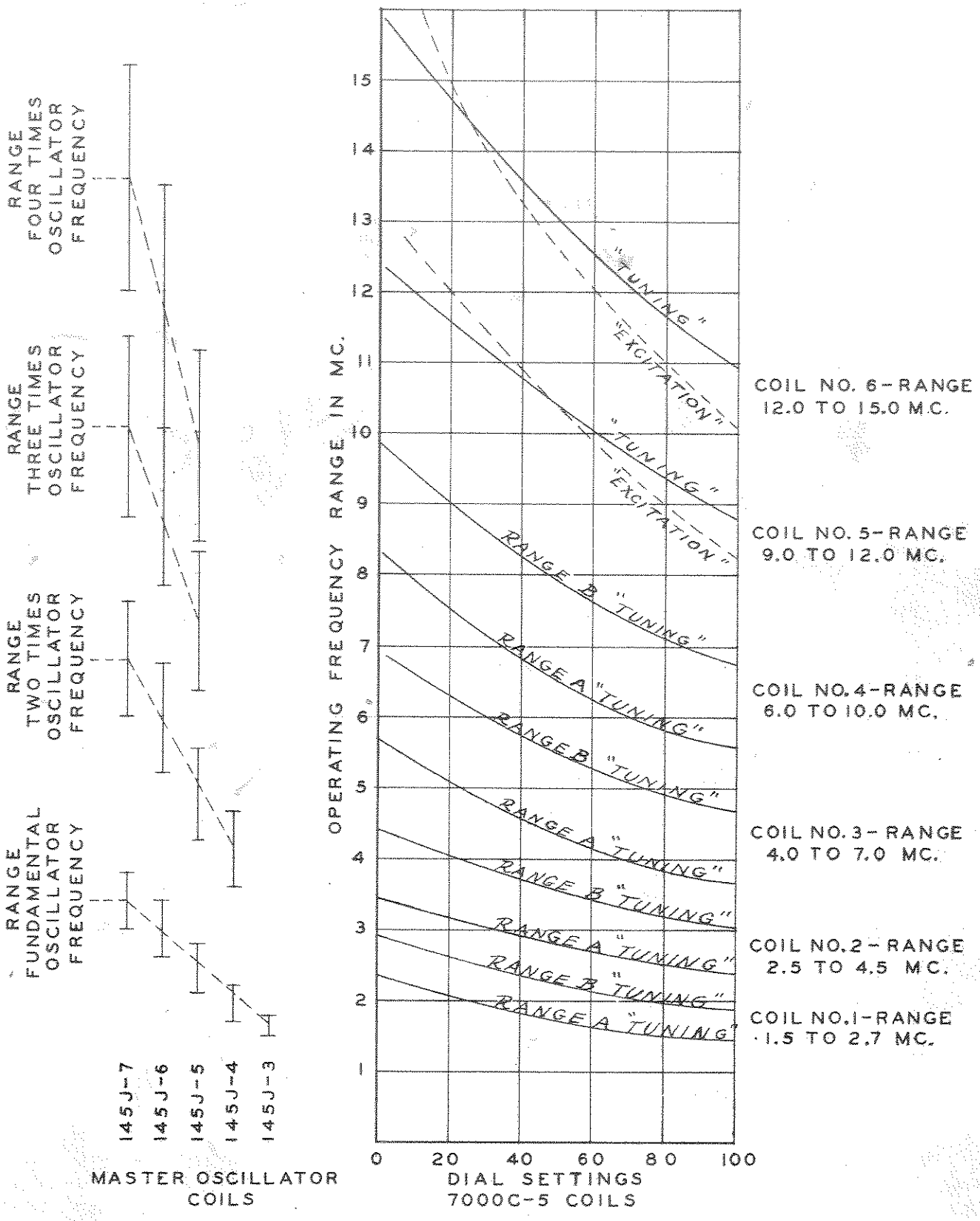


FIG. 9 411B POWER UNIT

TOP VIEW

COIL TUNING DATA
32 SERIES EQUIPMENT



TROUBLE SHOOTING

The most general cause of improper operation of radio equipment is tube failure. A complete set of tested tubes of the same types specified should be kept on hand at all times. If faulty operation of the transmitter is observed and tube failure suspected, each tube may be checked by replacing it with a like tube known to be in good condition. In case an open fuse is found, it is an indication of overload on some circuit in the transmitter. The overload may be caused by a short circuit. The short circuit may be due to a foreign article being dropped into the cabinet, a defective condenser, defective tubes or a high voltage arc. A direct short is most readily found by means of continuity meter. The d-c resistance of the various circuits may be checked in order to locate the fault.

Defective tubes causing an overload in power circuits may usually be located by inspection. It will be found that excessive heating or sputtering within the vacuum tubes is a good indication of a fault in the tube circuit. High voltage arcs may be caused by bent condenser plates, corrosion or dust. It is well known that one of the greatest sources of trouble in equipment located in a salt atmosphere is corrosion. Corrosion resulting from salt spray or salt laden atmosphere may cause failure of the equipment for no apparent reason. In general it will be found that contacts such as tap switches, tube prongs, cable plug connectors and relay contacts are most affected by corrosion. When it is necessary to operate the equipment in localities subject to such corrosive atmosphere, inspection of wiping contacts, cable plug, relays, etc., should be made more frequently in order to keep the equipment in good condition.

In general, trouble encountered in radio apparatus may be isolated by means of various tests and measurements, and the section of the transmitter determined in which the trouble is located. If this is done, the components of the associated circuit may be checked and the trouble located.

VI APPENDIX

APPENDIX

PERFORMANCE DATA

Typical Meter Readings

Selector Position	O	B	T	CW	PH
METER					
Plate Voltage—volts	0	0	250	550	450*
Excitation Plate—ma.	25	55	50	50	50
Grid Current—ma.	0	10	9	8	8
Final Plate—ma.	0	0	110	300	220
Antenna Current—amp.	0	0	.4	1.2	.9

* 0-200 V when used as modulation indicator.

Tuning Data

The table below shows the operating frequency and crystal frequency for each of the frequency selector positions. The blank spaces are provided for recording the approximate condenser settings, and number of turns used in the final amplifier coil at the time of installation.

SWITCH POSITION	1	2	3	4
Operating Frequency—kc.				
Crystal or M.O. Freq.—kc.				
Oscillator Condenser—%				
Buffer Condenser—%				
Final Amp. Cond.—%				
Antenna Condenser—%				
Coil—Turns				

APPENDIX

PARTS LIST

101L-1 PANEL ASSEMBLY

Item	Description	Specification	Part No.	Mfgr.	Mfgr. Type
101	Tuning Resistor	2000 ohm, 25 w	710NC2M	25P	
102	Excitation Plate Meter	0-200 ma	450NF200	80T	227
103	Power Amp. Plate Meter	0-500 ma	450NF500	80T	227
104	Power Amp. Grid Meter	0-25 ma	450NF25	80T	227
105	Antenna Ammeter	0-3 amp	457N98	80T	
106	Volt-Mod. Meter	0-500 v	458N021F	80T	
107	Filament Power Switch	DPST Toggle	260N101	84A	
108	Plate Power Switch	DPST Toggle	260N101	84A	
109	Selector Switch	3 Section, 5 Position	259N88	25C	
110	Microphone Receptacle	3 Contact, Chassis Mtg.	369N7	60A	
111	Key Jack	Open Circuit	360N106	05M	Midget
112A	R-F Unit Cable Socket	7 Prong	367N203	91J	1500
112B	R-F Unit Cable Socket	9 Prong	367N204	91J	1500
113A	Mod. Unit Cable Socket	7 Prong	367N203	91J	1500
113B	Mod. Unit Cable Socket	9 Prong	367N204	91J	1500
114A	Power Unit Cable Socket	7 Prong	367N203	91J	1500
114B	Power Unit Cable Socket	9 Prong	367N204	91J	1500
115	Channel Switch Detent	4 Pos. Detent & Shaft	A397	64C	
116	Keying Resistor	10,000 ohm, 10 w	710NA10M	25P	Brown Devil

33K-8 R-F UNIT

201	Osc. Grid Resistor	50,000 ohm ±10% 1 w	704N50M	28J	BT1
202	Osc. Screen Resistor	50,000 ohm ±10% 2 w	706N50M	28J	BT2
203	Osc. Plate Drop. Resistor	5000 ohm ±10% 8 w	710NA5M	25P	Brown Devil
204	Doubler Grid Resistor	100,000 ohm ±10% 2 w	706N100M	28J	BT2
205	Doubler Cathode Resistor	1000 ohm ±10% 10 w	710NA1M	25P	Brown Devil
206	Doubler Screen Resistor	100,000 ohm ±10% 2 w	706N100M	28J	BT2
207	Osc. Cathode Resistor	1000 ohm ±10% 2 w	706N1M	28J	BT2
208	Amp. Pl. Parasitic Suppressor (3)	47 ohm ±10% 1 w	A273	64C	
209	Amp. Screen Resistor	10,000 ohm ±10% 25 w	710NC10M	25P	
210	Amp. Grid Parasitic Suppressor (3)	27 ohm ±10% ½ w	710N27	22A	EB
211	Osc. Grid Capacitor	.000025 mfd ±10% 900 T.V.	909N425D	02S	D
				64S	MT
212	Osc. Cathode Bypass Cap.	.00025 mfd ±10% 900 T.V.	909N325D	02S	D
				64S	MT
213	Osc. Screen Bypass Cap.	.006 mfd ±10% 1000 T.V.	910N260E	02S	BE-10
214	Osc. Plate Decoupling Cap.	.006 mfd ±10% 1000 T.V.	910N260A	75C	9L
				02S	A-10
				64S	XM
215	Doubler Cathode Bypass Cap.	.006 mfd ±10% 1000 T.V.	910N260A	75C	9L
				02S	A-10
				64S	XM

APPENDIX

PARTS LIST

33K-8 R-F UNIT (Cont.)

Item	Description	Specification	Part No.	Mfgr.	Mfgr. Type
216	Doubler Screen Bypass Cap.	.006 mfd ±10% 1000 T.V.	910N260A	75C	9L
				02S	A-10
				64S	XM
217	Doubler Plate Block Cap.	.0005 mfd ±10% 1000 T.V.	910N350A	75C	9L
				02S	A-10
				64S	XM
218	Amp. Screen Bypass Cap. (2)	.002 mfd ±10% 1500 T.V.	915N220E	02S	BE-15
219	Amp. Pl. Block. Cap.	.002 mfd ±10% 5000 T.V.	950N220A	02S	BE-15
220	CH #1 Output Tuning Cap.	420 mmfd Variable	920N98A	77J	H
221	CH #2 Output Tuning Cap.	420 mmfd Variable	920N98A	77J	H
222	CH #3 Output Tuning Cap.	420 mmfd Variable	920N98A	77J	H
223	CH #4 Output Tuning Cap.	420 mmfd Variable	920N98A	77J	H
224	Doubler Grid Coupling Cap.	.0005 mfd ±10% 900 T.V.	909N350C	75C	1W
				02S	C
				64S	MW
225	Amp. Grid Coupling Cap.	.008 mfd ±20% 600 T.V.	909N280C	02S	C
				75C	1W
226	CH #1 Amp. Pl. Tuning Cap.	250 mmfd Variable	920N97A	77J	F
227	CH #2 Amp. Pl. Tuning Cap.	250 mmfd Variable	920N97A	77J	F
228	CH #3 Amp. Pl. Tuning Cap.	250 mmfd Variable	920N97A	77J	F
229	CH #4 Amp. Pl. Tuning Cap.	250 mmfd Variable	920N97A	77J	F
230	Amp. Cathode Bypass Cap. (2)	.006 mfd ±10% 1500 T.V.	915N260E	02S	BE-15
231	Osc. Cathode R-F Choke	2.5 mh 0.125 amp 50 ohm	240N53	05N	
232	Doubler Plate R-F Choke	2.5 mh 0.125 amp 50 ohm	240N53	05N	
233	Amp. Grid R-F Choke	2.5 mh 0.125 amp 50 ohm	240N2	05N	
234	Amp. Plate R-F Choke	2.5 mh 0.5 amp 8.0 ohm	240N25	05H	
235	Static Drain R-F Choke	1.0 mh 0.6 amp 6.0 ohm	240N26	82C	
236	Exciter Section-Channel Selector Switch (5)	1 Pole, 11 pos., 1 Sec., Shorting	269N8	05P	"H"
237	Thermocouple for Ant. Ammeter	0-3 amp a-c	457N97	80T	
238	Osc. Grid Block. Cap.	.008 mfd ±20% 600 T.V.	909N280C	02S	C
				75C	1W
239	Osc. Grid Leak Resistor	10,000 ohm ±10% 1 w	704N10M	28J	BT1
240	Osc. Plate Choke	30 mu h 100 ma 1.0 ohm	A1125	64C	
241	Output Section-Channel Selector Switch (3)	1 Pole, 4 Pos., Shorting Tap Switch	269N26	05P	"H"
242	Cable Connector Plug	16-Contact Plug	367N115	91J	1500
243	CH #1 Section MO Tank Cap.	.001 mfd ±1% 1000 T.V.	912N210D	75C	1R
244	CH #2 Section MO Tank Cap.	.001 mfd ±1% 1000 T.V.	912N210D	75C	1R
245	CH #3 Section MO Tank Cap.	.001 mfd ±1% 1000 T.V.	912N210D	75C	1R
246	CH #4 Section MO Tank Cap.	.001 mfd ±1% 1000 T.V.	912N210D	75C	1R
247	CH #1 Section MO Tank Cap.	.002 mfd ±1% 1000 T.V.	912N220D	75C	1R
248	CH #2 Section MO Tank Cap.	.002 mfd ±1% 1000 T.V.	912N220D	75C	1R
249	CH #3 Section MO Tank Cap.	.002 mfd ±1% 1000 T.V.	912N220D	75C	1R

APPENDIX

PARTS LIST

33K-8 R-F UNIT (Cont.)

Item	Description	Specification	Part No.	Mfgr.	Mfgr. Type
250	CH #4 Section MO Tank Cap.	.002 mfd ±1% 1000 T.V.	912N220D	75C	1R
	6L6G Tube Socket (2)	8 Term. Chassis Mtg. Socket	220N183	60A	
	MO Coil and 807 Sockets (7)	5 Term. Chassis Mtg. Socket	220N153	60A	
	Coil Socket (4)	7 Term. Chassis Mtg. Socket	220N177	60A 65M	

9Z-1 MODULATOR

301	6C5 Cathode Resistor	2500 ohm, 2 w.	706N2500	28J	BT2
302	6C5 Decoupling Resistor	50,000 ohm, 2 w.	706N50M	28J	BT2
303	6L6 Grid Decoupling	20,000 ohm, 1 w.	704N20M	28J	BT1
304	6L6 Cathode Resistor	50 ohm, 10 w.	710NA50	25P	Brown Devil
305	6L6 Cathode Resistor	100 ohm, 10 w.	710NA100	25P	Brown Devil
306	6L6 Grid Parasitic Resistor	250 ohm, ½ w.	707N250	28J	BW-½
307	6L6 Plate Parasitic Resistor	10 ohm, 1 w.	703N10	22A	GB
308	Voltmeter Multiplier	500,000 ohm, 1 w.	704N500M	28J	BT1
309	Mod. Meter Multiplier	15,000 ohm, 1 w.	704N15M	28J	BT1
310	Mod Meter Adjustment	10,000 ohm Potentiometer	377N225	05M	M
311	Audio Gain Control	10,000 ohm Potentiometer	377N225	05M	M
312	Micr. Cur. Bal. Resistor	50 ohm, 10 w.	710NA50	25P	Brown Devil
313	6C5 Decoupling Cond.	4 mfd. 600 v. Cond.	930N62	64S	
314	6L6 Screen Condenser	4 mfd. 600 v. Cond.	930N62	64S	
315	Micr. Cur. Filter Condenser	20 mfd. 100 v.	183N5	75C	CCA-AY
316	6L6 Cathode Condenser	20 mfd. 100 v.	183N5	75C	CCA-AY
317	Mod. Meter Coupling Condenser	2 mfd. 600 v.	930N61	64S	
318	Audio Input Transformer	500 or 200 ohm to 80,000 ohm	667S210G	55C	7C-L70
319	Interstage Transformer	20,000 ohm to 80,000 ohm	667S228F	55C	7E8-L70
320	Modulation Transformer	4100 ohm C.T. or 1880 ohm to 2200 ohm	667S355A	55C	7F-52
321	Mod. Meter Switch	DPDT Toggle	260N102	84A	
322	Meter Rectifier		353N3	67C	M-2
324	Cable Receptacle	16 Contact Plug	367N115	91J	1500
325	Octal Tube Socket	8 Prong Bakelite	220N181	60A	

411B-1 POWER UNIT

401	Section 400 v. Bleeder	3,000 ohm, 25 w.	710NC3M	25P	
402	Section 400 v. Bleeder	25,000 ohm, 25 w.	710NC25M	25P	
403	Bias Resistor	1,000 ohm, 25 w.	710NC1M	25P	
404	H.V. Bleeder Resistor	50,000 ohm, 50 w.	710ND50M	25P	
405	Bias Filter Cond.	2 mfd. 600 v.	930N61	64S	
406	L.V. Output Filter Cond.	4 mfd. 600 v.	930N62	64S	
407	L.V. Input Filter Cond.	4 mfd. 600 v.	930N62	64S	
408	H.V. Output Filter Cond.	10 mfd. 600 v.	930N11	75C	KG
409	H.V. Filter Condenser	10 mfd. 600 v.	930N11	75C	KG
410	L.V. Filter Reactor	10 hy, 200 ma.	668S453A	55C	8A-31

APPENDIX

PARTS LIST

411B-1 POWER UNIT (Cont.)

Item	Description	Specification	Part No.	Mfgr.	Mfgr. Type
411	H.V. Output Filter Reactor	4 hy, 400 ma	668S75B	55C	8A-40
412	H.V. Input Filter Reactor	4 hy, 400 ma.	668S75B	55C	8A-40
413	H.V. Power Transformer	675/675 v. 0.353A r.m.s.	662S550	55C	2A4-64
414	Filament Transformer	5 v. C.T., 3A; 5 v. C.T., 6.0A 2.5 v. C.T. 2.0A; 6.3 v. C.T., 10A	662S446	55C	2BE-5075
415	L.V. Power Transformer	400/400 v. 0.27A	662S463	55C	2A2-50
416	Line Fuse	10A Plug Type	264N110	40E	Plug
417	H.V. Primary Fuse	6A Plug Type	264N106	40E	Plug
418	L.V. Primary Fuse	3A Plug Type	264N103	40E	Plug
419	Power Input Receptacle	A.C. Flush Mtg. Plug.	368N1	80H	
420	Push-to-Talk Relay	6 v. A.C.; N.O. Contacts	410N15	85G	Series 40
421	Fuse Receptacles (3)	For Plug Fuse	265N101	90B	
422	Rectifier Tube Socket (3)	4 Prong Bakelite	220N141	60A	
423	Cable Receptacle	16 Contact	367N115	91J	1500

LIST OF MANUFACTURERS

Mfgr. Code	Manufacturer
22A	Allen-Bradley Company 118 W. Greenfield Avenue Milwaukee, Wisconsin
60A	American Phenolic Corp. 1250 W. Van Buren St. Chicago, Illinois
84A	Arrow-Hart & Hegeman Co. 103 Hawthorne Street Hartford, Connecticut
90B	Bryant Electric Company Barnum Station Bridgeport, Connecticut
25C	Centralab, Inc. 900 East Keefe Milwaukee, Wisconsin
55C	Chicago Transformer Corp. 3501 West Addison Chicago, Illinois
64C	Collins Radio Company Cedar Rapids, Iowa
67C	Conant Electrical Labs. 135 North 66th Street Lincoln, Nebraska
75C	Cornell-Dubilier Electric Corp. 1000 Hamilton Blvd. South Plainfield, New Jersey
82C	Coto-Coil Company 71 Willard Avenue Providence, Rhode Island
40E	Economy Fuse & Mfg. Co. Greenview Ave. at Diversey Parkwy. Chicago, Illinois
85G	Guardian Elec. Mfg. Company 1620-27 West Walnut Street Chicago, Illinois
05H	Hammarlund Mfg. Company 424 W. 33rd Street New York, New York
80H	Harvey Hubbell, Inc. 1930 Thomas Street Bridgeport, Connecticut
28J	International Resistance Co. 1100 Terminal Commerce Bldg. Philadelphia, Pennsylvania
77J	E. F. Johnson Company Waseca, Minnesota
91J	Howard B. Jones 2300 West Wabansia Avenue Chicago, Illinois
05M	P. R. Mallory & Company Newton & Cook Streets Indianapolis, Indiana
65M	James Millen Mfg. Co. 150 Exchange Street Milden, Massachusetts
05N	National Company, Inc. Malden, Massachusetts
05P	Oak Mfg. Company 711 West Lake Street Chicago, Illinois
25P	Ohmite Mfg. Company 4837 Flournoy Street Chicago, Illinois
02S	Sangamo Electric Company 1935 Funk Street Springfield, Illinois
64S	Solar Mfg. Corporation Bayonne, New Jersey
80T	Triplett Elec. Inst. Co. Bluffton, Ohio

APPENDIX

SERVICE REPORT

REPLACEABLE COMPONENTS

Please fill out this form and submit it by mail to the COLLINS RADIO COMPANY, CEDAR RAPIDS, IOWA, U.S.A., when reporting failure of component parts. A properly completed report must be submitted for each part before any accounts will be adjusted. An accurate report will assure the correct replacement part.

IDENTIFICATION OF COMPONENT

Owner_____

Equipment Type No._____ Serial No._____

Unit Type No._____ Serial No._____

Component Item No._____ Stock No._____

Description of Component_____

_____

_____

SERVICE DATA

Date Equipment Received_____ Date in Service_____

Date of Failure_____ Hours of Service_____

NATURE OF FAILURE_____

_____

_____

_____

_____

OPERATING DATA AND CONDITIONS (At time of Failure)

Line Voltage_____ Abnormal Meter Readings_____

Ambient Temperature_____ °F. Electrical Storm?_____

Associated Fuse Failure_____

Additional Comments_____

_____

_____

_____

_____

APPENDIX

SERVICE REPORT

REPLACEABLE COMPONENTS (CONT.)

PRESENT STATUS OF EQUIPMENT

Out of Service_____ Component Replaced_____

Temporary Repair (state nature)_____

_____

Date of Report_____ Signed_____

THESE ENTRIES TO BE MADE BY THE COLLINS RADIO COMPANY

Received_____ R.T. No._____ Replacement Order No._____

Results of Factory Test:_____

_____

Disposition_____

_____

APPENDIX

SERVICE REPORT

REPLACEABLE COMPONENTS

Please fill out this form and submit it by mail to the COLLINS RADIO COMPANY, CEDAR RAPIDS, IOWA, U.S.A., when reporting failure of component parts. A properly completed report must be submitted for each part before any accounts will be adjusted. An accurate report will assure the correct replacement part.

IDENTIFICATION OF COMPONENT

Owner_____

Equipment Type No._____ Serial No._____

Unit Type No._____ Serial No._____

Component Item No._____ Stock No._____

Description of Component_____

_____

_____

SERVICE DATA

Date Equipment Received_____ Date in Service_____

Date of Failure_____ Hours of Service_____

NATURE OF FAILURE_____

_____

_____

_____

_____

OPERATING DATA AND CONDITIONS (At time of Failure)

Line Voltage_____ Abnormal Meter Readings_____

Ambient Temperature_____ °F. Electrical Storm?_____

Associated Fuse Failure_____

Additional Comments_____

_____

_____

_____

_____

APPENDIX

SERVICE REPORT

REPLACEABLE COMPONENTS (CONT.)

PRESENT STATUS OF EQUIPMENT

Out of Service_____ Component Replaced_____

Temporary Repair (state nature)_____

_____

Date of Report_____ Signed_____

THESE ENTRIES TO BE MADE BY THE COLLINS RADIO COMPANY

Received_____ R.T. No._____ Replacement Order No._____

Results of Factory Test:_____

_____

Disposition_____

_____

MAT:	GRADE:	DRAWN BY: W F S DATE:	COLLINS RADIO COMPANY
FINISH:		TRACED BY: R M G DATE: 2-19-41	CEDAR RAPIDS IOWA
UNIT 32RA-7 COMPLETE SCHEMATIC	SCALE	CHECKED BY: W F S DATE: 3-26-41	DRAWING NO. 104D-1

BOTTOM VIEW

MO COIL

CRYSTAL

33K-8 R.F. UNIT

TO HEATERS

NOTE
ALL TAP SWITCH PIES GANGED
236

ANTENNA

GROUND

807 807 807 6L6 6L6

33K-8 R.F. UNIT
HEATER CONNECTIONS

6C5 6L6 6L6 6L6 6L6

9Z-1 MODULATOR
HEATER CONNECTIONS

101L-1 PANEL

SELECTOR

PLATE

FIL.

EXC. PLATE

FINAL PLATE

FINAL GRID

MOD.

ANT. CURRENT

411B-1 POWER SUPPLY

110V 60~

RK60

RK60

80

9Z-1 MODULATOR

6L6G

6L6G

6L6G

6L6G

6C5G

TO HEATERS

D146B