20T

A M BROADCAST TRANSMITTER

INSTRUCTION BOOK

INSTRUCTION BOOK

for

TYPE 20T A M BROADCAST TRANSMITTER

1000 WATTS

Manufactured By

COLLINS RADIO COMPANY, Cedar Rapids, Iowa

520 9312 00

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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, detailed instructions as to how the equipment is to be returned will be issued. Do not return any material until instructed to do so by the company.

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:

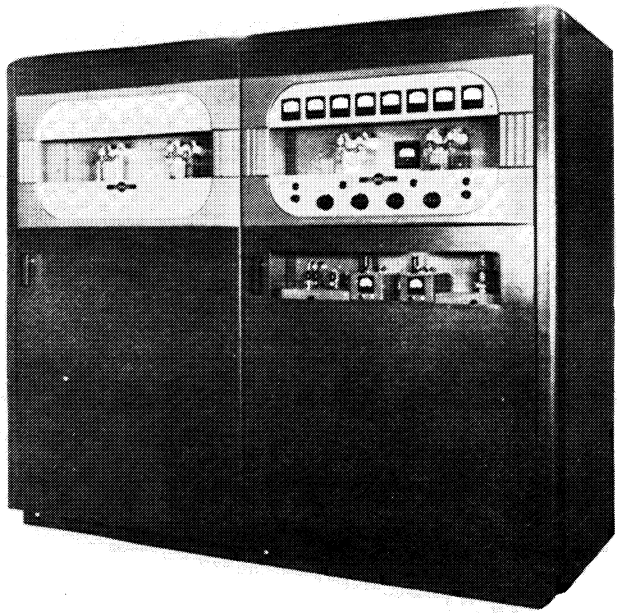
(A) Date of delivery of equipment.
(B) Date placed in service.
(C) Number of hours in service.
(D) Part number of item.
(E) Item number (obtain from Parts List or Schematic Diagram).
(F) Type number of unit from which part is removed.
(G) Serial number of unit.
(H) Serial number of the complete equipment.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

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

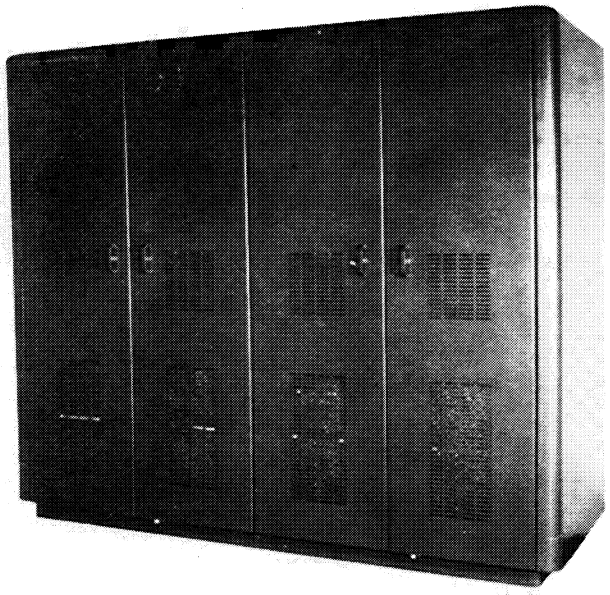
(A) Quantity required.
(B) Part number of item.
(C) Item number (obtain from Parts List or Schematic Diagram).
(D) Type number of unit.
(E) Serial number of unit.
(F) Serial number of equipment.

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

CHECK THESE FEATURES OF THE 20T TRANSMITTER

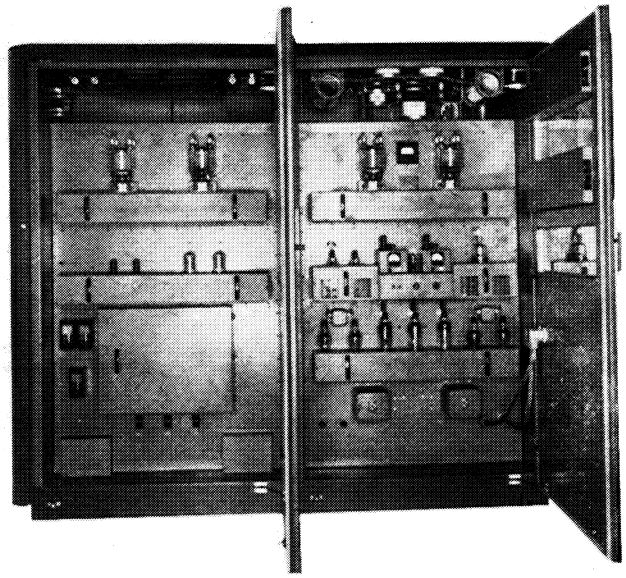


- ✓ VERTICAL CHASSIS.
- ✓ ALL COMPONENTS ACCESSIBLE.
- ✓ COMPLETE TUBE VISIBILITY.



- ✓ REPLACEABLE DUST FILTERS.
- ✓ COMPLETE VENTILATION.
- ✓ SPLIT REAR DOORS.
- ✓ PERSONNEL SAFETY FACTORS.

- ✓ MODERN DESIGN.
- ✓ INSTANTANEOUS POWER CHANGE.
- ✓ CENTRALIZED CONTROL & METERING.
- ✓ CIRCUITS COMPLETELY METERED.



- ✓ TWO COMPLETE OSCILLATORS.
- ✓ WIDE RANGE MATCHING NETWORK.
- ✓ LARGE SAFETY FACTOR COMPONENTS.
- ✓ HIGH FIDELITY.

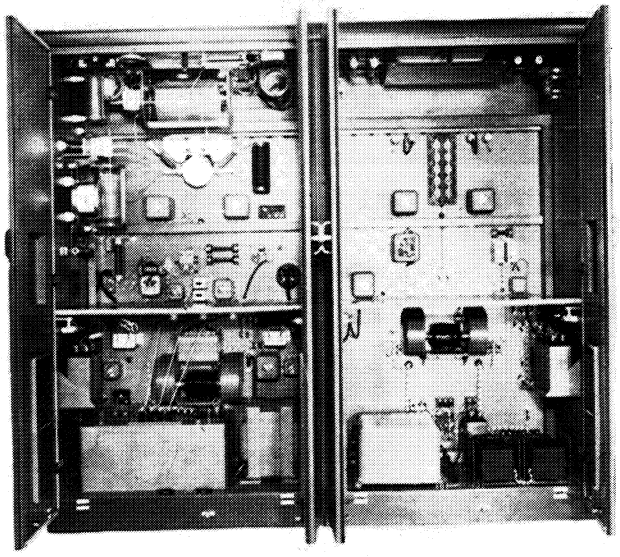


Figure 1-1 20T Transmitter Complete Front & Rear Views

SECTION 1

GENERAL DESCRIPTION

1.1. GENERAL.

The Collins Type 20T, 500/1000 watt standard AM Broadcast Transmitter has been designed particularly for high fidelity broadcast service. Numerous outstanding features are incorporated throughout the equipment to meet the demands for better service that is required of Modern Broadcast Equipment.

1.2. MECHANICAL DESCRIPTION.

1.2.1. General. - The transmitter is mounted in two cabinets neatly styled for impressive appearance. The complete equipment occupies a space 38-5/8" deep by 93" wide by 79-3/8" high and weighs approximately 3600 lbs. For accessibility and serviceability, component parts are mounted on a vertical chassis within each cabinet. With this arrangement it is a simple matter to gain access to all components if necessary. Tube spars have been arranged with a cover that can be easily removed to make all parts thereunder readily accessible. For service and maintenance purposes, full length hinged doors, one on the front and two on the rear of each cabinet, are provided. With the transmitter closed, complete tube visability is procured by means of large glass windows incorporated in the front doors. Each door of the transmitter is arranged with a positive wedge type door switch which removes low voltage as well as high voltage when opened. In addition, a mechanical device, consisting of a metal arm appropriately designed, has been incorporated on both front doors as well as on two of the rear doors. This safety device will short out the high voltage supply when these doors are open. The previous mentioned door switch opens the control circuit prior to the mechanical high voltage shorting operation and upon closing the doors the high voltage shorting arm is removed from the shorting position before the door switch is closed.

All meters are placed in an easily read position on the front door of the R-F and RECTIFIER cabinet. Their location enables the operating personnel to operate the tuning controls while observing the meter indications, at or near eye level.

1.2.2. Control System. - All operating controls in the 20T transmitter are conveniently located on the front door of the R-F and RECTIFIER cabinet. They consist of a Filament Power control station, a Plate Power control station, a Power Level switch, a Meter Selector switch, a Tuning Selector switch, and a single tuning control which serves to control all of the tuning adjustments in the transmitter. All major tuning controls are motor driven and function through the Tuning Control Knob. The Filament Start-Stop station as well as the Plate Start-Stop station consists of a single control which is pulled for starting and pushed for stopping operations. This arrangement enables the operators to promptly find the right switch in case of emergency.

1.2.3. Ventilation. - To keep the interior of the transmitter at a safe temperature, forced ventilation is applied. Ventilating blowers are located in each cabinet and are arranged so that their output is directed to the front of the vertical chassis.

The air is drawn in at the bottom rear of the transmitter through replaceable dust filters and forced up along the surface where the tubes are mounted and out through a large opening in the

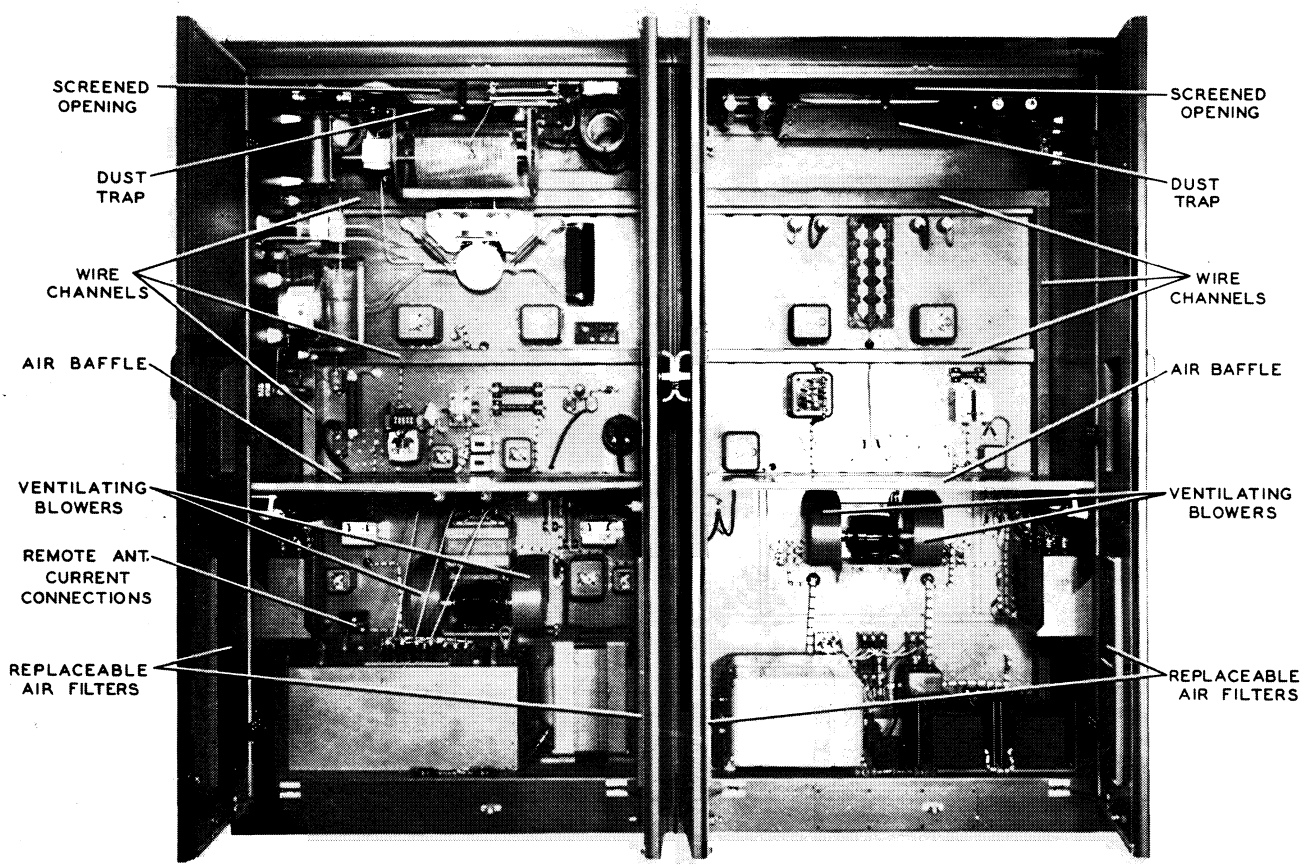


Figure 1-2 20T Ventilating System

roof of each cabinet. This method provides quick elimination of air around the heated tubes. Components on the rear side of the vertical chassis are cooled by convection aided by the draft created by the ventilating blowers. Several openings exist throughout the transmitter for ventilation of wiring and components. All openings where practical, are screened to prevent insects, etc., from entering the equipment. Dust traps have been installed at the ventilating opening in the roof to prevent dust from settling on the equipment during the period when the transmitter is not in operation.

1.3. ELECTRICAL DESCRIPTION.

1.3.1. General. - The 20T Transmitter is provided with A-C overload protection by means of magnetic circuit breakers placed in the control circuit, the filament and low voltage circuit and the high voltage primary circuit. The modulator, r-f power amplifier and the r-f driver are equipped with d-c overload protection. The d-c overload relays are adjustable and provide visible means of observing which has been tripped due to an overload.

Instantaneous power change is accomplished without any interruption of program, by simply rotating a switch on the front panel.

1.3.2. Voltage Supply. - The transmitter employs two power supplies. The high voltage supply employs three type 8008 half wave mercury vapor rectifiers in a 3 phase half wave circuit and furnishes d-c voltage for application to the plates of the intermediate amplifier, power amplifier and modulator tubes. The low voltage supply employs four type 866A mercury vapor rectifier tubes connected in a parallel full wave rectifier circuit. This supply is arranged so that a low voltage of about 520 volts is obtained and a bias of 80 volts is available. This bias is supplied to the modulator tubes through separate controls and to the r-f driver stage.

1.3.3. Audio System. - The audio system in the 20T is push-pull triodes throughout the three stages. The first stage employs two type 6N7 tubes, the driver stage two type 845 tubes and the modulator two type 833A tubes operating Class B. A feedback loop is incorporated, from the plates of the modulator tubes to the grids of the input stage for stabilization.

1.3.4. R-F Circuits. - The r-f section of this transmitter is a straight forward design. Proper circuit Q's are maintained throughout the entire broadcast band. Inductive tuning is used where it is an advantage, and circuit Q is important.

Two complete plug in type oscillator units are provided in the equipment. Either one may be chosen for operation by an oscillator selector switch. A type 807 beam pentode tube operating Class A is employed in the buffer stage following the oscillator. The buffer amplifier utilizes two 807's connected in parallel and operating Class C. Following the buffer amplifier is the intermediate amplifier stage employing a type 4-125A tube. The r-f power amplifier utilizes two parallel operated 833A's.

Figure 1-3 Oscillator Unit Removal

It employs simple coil neutralization. The output network is a combination pi-network followed by a "T" section filter. Provisions have been made in the r-f section for connecting a frequency monitor, audio monitor and modulation monitor.

1.4. REFERENCE DATA.

1.4.1. Frequency Range. - This transmitter will operate on any one frequency in the range of 540 to 1600 kc. After the frequency of operation has once been set any substantial change in frequency will require modification of the tank circuit components as well as changes in the neutralizing system.

1.4.2. Character of Emission. - The modulation system of the 20T transmitter is designed to provide full 100% modulation of the carrier at modulating frequencies between 30 and 10,000 cps. The audio frequency response is constant within plus or minus 1 db of the mean value between 30 and 10,000 cps. The audio frequency distortion is less than 3% up to 95% modulation. The residual noise level is 65 db below the 100% modulated level.

1.4.3. Power Output. - The transmitter will deliver 1100 watts of radio frequency power, on any frequency within the range of 540 to 1600 kc, into a resistive transmission line load, (75 ohms is standard; other impedances are available). Provision is made for instantaneous reduction to one-half power by reducing the plate voltage on the power amplifier tubes.

1.4.4. Power Source and Input Requirement. - This equipment has been designed to operate from a 208 or 230 volt, 3 phase, 60 cycle power system. The maximum power demand at 100% modulation with a modulating frequency of 400 cps is approximately 4.75 kw at a power factor of 85%.

1.4.5. Audio Input. - An audio input level of approximately 18 dbm is required for full 100% tone modulation. The audio input impedance is 600 ohms standard; and 150 ohms available.

1.5. VACUUM TUBE COMPLEMENT.

The vacuum tubes employed in the 20T equipment are listed below:

Qty.	Tube Type	Function
2	6F6	R-F Oscillator
1	807	Buffer
2	807	Buffer Amplifier
1	4-125A	Intermediate Amplifier
2	833A	R-F Power Amplifier
2	6N7	Audio Amplifier
2	845	Audio Driver
2	833A	Modulator
3	8008	HV Rectifier
4	866/866A's	LV Rectifier
2	OC3/VR105	Voltage Regulator

SECTION 2

INSTALLATION OF TRANSMITTER

2.1. PRIME INSTALLATION.

2.1.1. Preliminary.

(a) Unpacking. - Caution should be used when uncrating to avoid damage to the equipment. All units should be inspected carefully. Inspect each unit for loose screws and bolts. Check all controls such as switches etc., for proper operation as far as can be determined without the application of power. Inspect cables and wiring and make sure that all cable connections are tight. All claims for damage should be filed promptly with the transportation company.

2.1.2. Installation Procedure.

(a) 20T Transmitter. - The transmitter is shipped with the heavier iron core units as well as some of the more fragile parts removed from the cabinets. It is recommended that no attempt be made to place these components in position until the cabinets have been permanently placed on the transmitting room floor. Refer to figures 2-1 and 2-2 to simplify placement of components that were removed when the equipment was prepared for shipment. Wires that are removed from the units to which they connect are tagged before shipment. Should any of these tags become lost, refer to the various cabling diagrams for assistance in identifying such leads. The comparatively simple arrangement to accommodate the wiring at the base of the transmitter is outlined in figure 2-3. The requirements of the illustration may be met by suitably installing the necessary conduit in a concrete floor or by the installation of a conduit trench of sufficient size. Another alternative would be to install a false floor under which the necessary wiring may be placed.

Adequate clearance should be allowed in front of the units for the operator to adjust the controls. There should be a clearance of at least 4 feet at the rear of the transmitter for installing and removing the units in the transmitter. Enough clearance at the ends of the 20T unit should be allowed to make the external connections and permit placement of the dust covers.

(b) Inter-Unit Wiring. - For the purpose of identification on the cabling diagrams each unit has been assigned an arbitrary letter designation. These unit letters are used as a suffix when referring to the terminals on any unit. Inter-unit wiring on the cabling schematics is indicated by showing at any terminal the type of wire and the terminal and unit to which each wire routes.

The following tabulation lists the unit letters and description of the various units in the transmitter:

Unit Letter Designation	Unit Description
A	Power Change
B	Modulator
C	Audio Amplifier
D	Transmitter Control
E	Modulator-Base Mounted Components
F	Inter Cabinet Cable Panel
G	Output Network
H	R-F Power Amplifier
J	R-F Exciter
K	Rectifier
L	High Voltage Supply
M	Inter Cabinet Cable Panel
N	Meter Panel
P	Control Panel
Q	Door Connectors

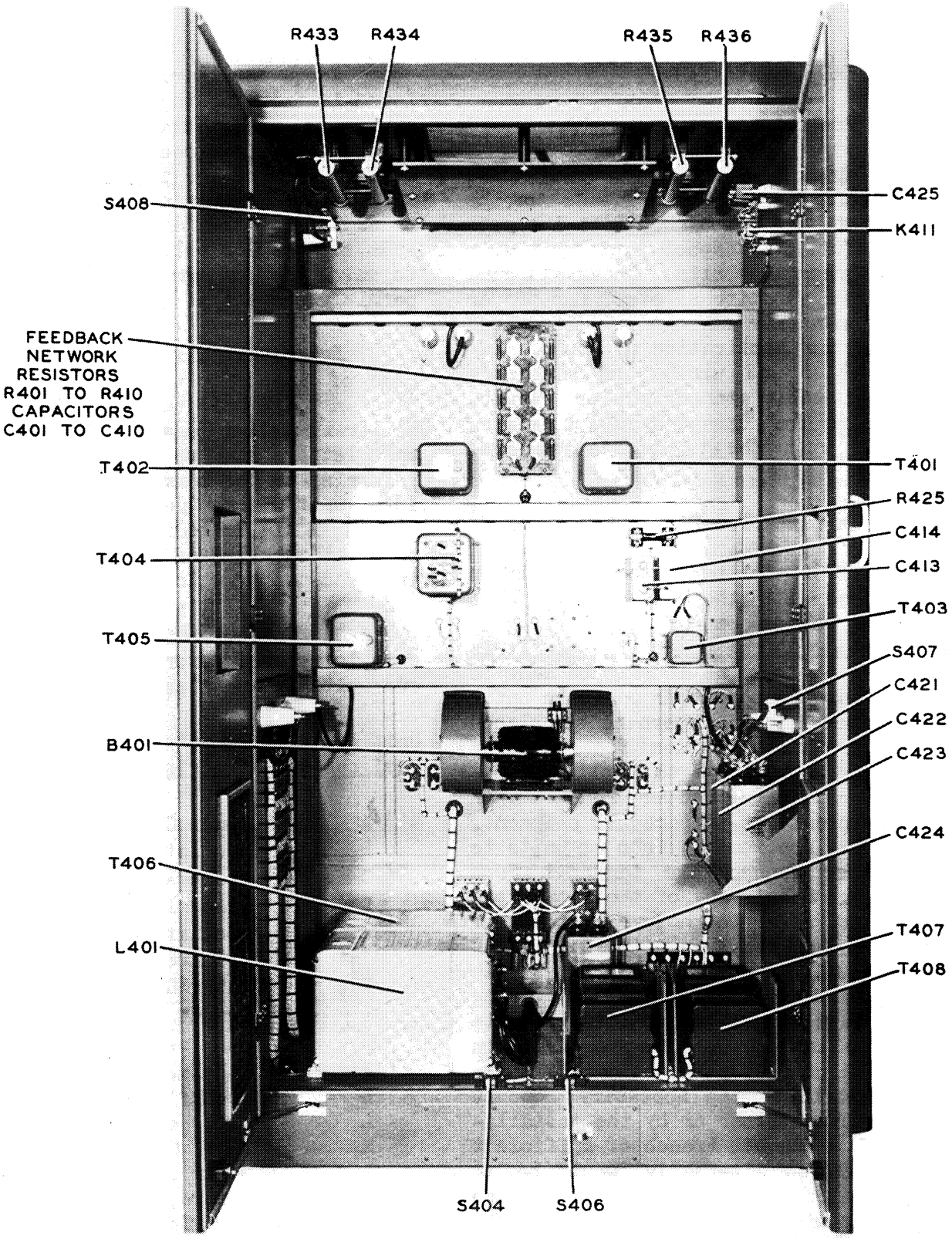


Figure 2-1 Audio and Control Bay - Inside Rear View

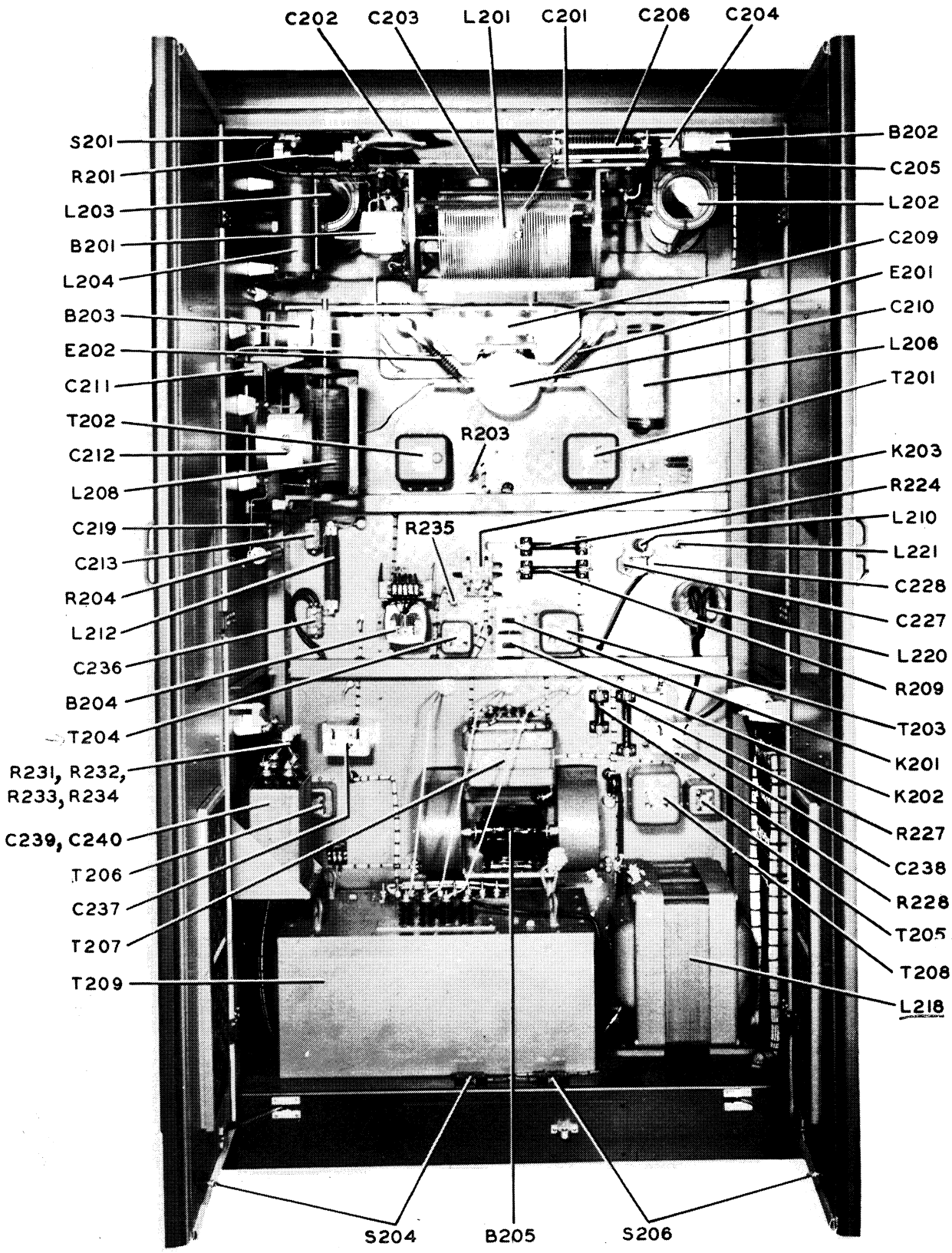
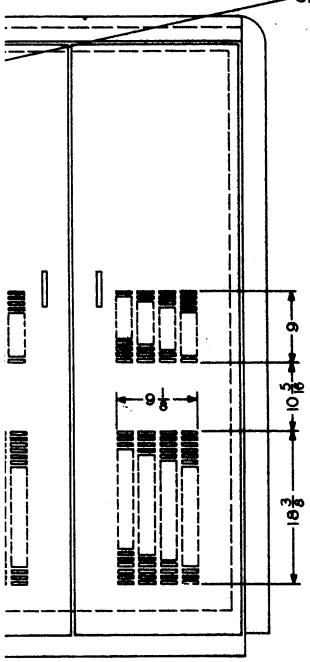


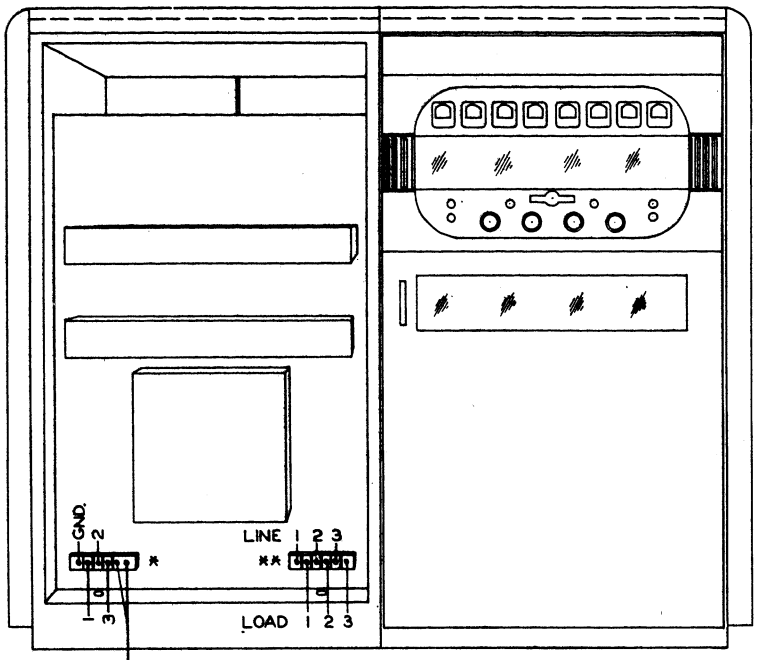
Figure 2-2 R.F. and Rectifier Bay - Inside Rear View

CONNECTIONS.

SEE DETAIL "A".



IE CABLE BETWEEN CABINETS IS
RMINATED ON TWO EASILY ACCESSIBLE
IOUPS OF TERMINAL STRIPS, EACH
MBERED IN ACCORDANCE WITH THE
BLING NUMBERING SYSTEM AND
OVIDES CONNECTIONS FOR ANY REMOTE
NTROL REQUIRED OR ADDITIONAL
NTROL CIRCUITS THAT MIGHT BE
SIRABLE.

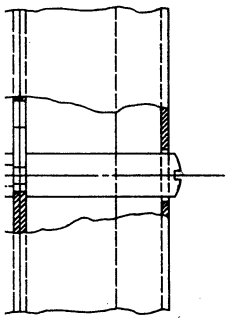


AUDIO INPUT
CONNECTIONS.

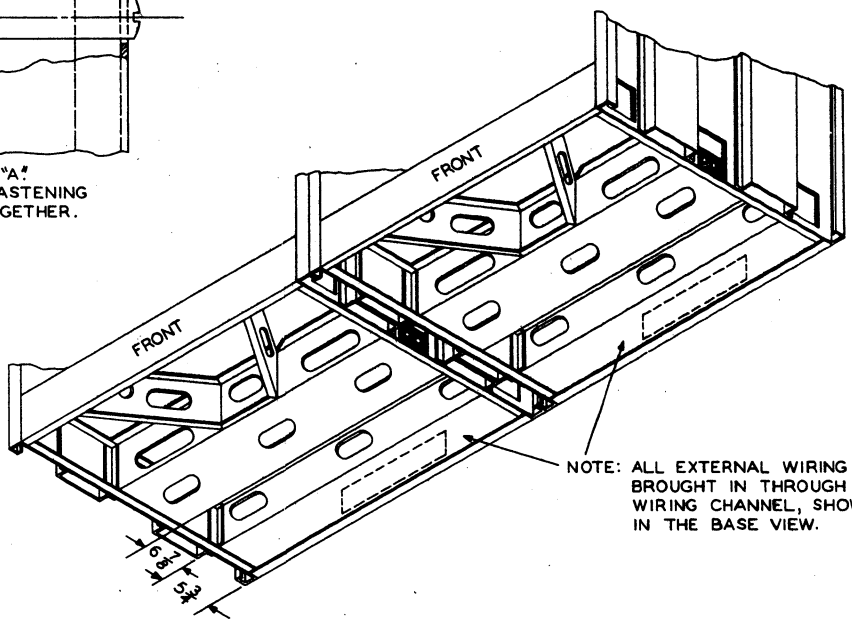
* RUN POWER INPUT CABLE AND AUDIO CABLE UP THROUGH GROMMET HOLE LOCATED BELOW TERMINAL STRIP. CONNECT POWER CABLE TO TERMINALS 1,2,3, AND GROUND. CONNECT AUDIO CABLE TO TERMINALS INDICATED.

** THESE TERMINALS HAVE BEEN PROVIDED FOR THE CONNECTION OF A CONSTANT VOLTAGE TRANSFORMER OR AN INDUCTION TYPE VOLTAGE REGULATOR. IF A VOLTAGE REGULATOR IS NOT USED, THE TERMINALS SHOULD BE JUMPERED WITH BUSS WIRE AS FOLLOWS:

LINE TERM. 1 TO LOAD TERM. 1
LINE TERM. 2 TO LOAD TERM. 2
LINE TERM. 3 TO LOAD TERM. 3



AIL "A".
F FASTENING
TOGETHER.



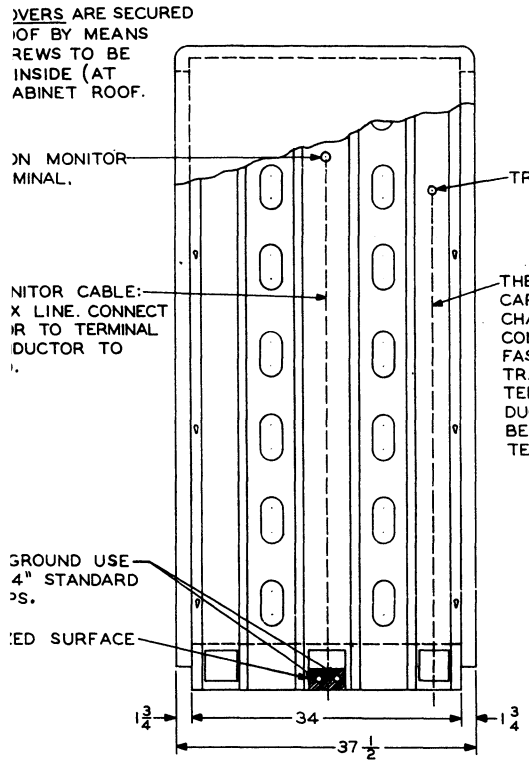
NOTE: ALL EXTERNAL WIRING IS BROUGHT IN THROUGH THE WIRING CHANNEL, SHOWN IN THE BASE VIEW.

NOTE:
OVERALL WEIGHT OF TRANSMITTER IS APPROX. 3600 LBS.

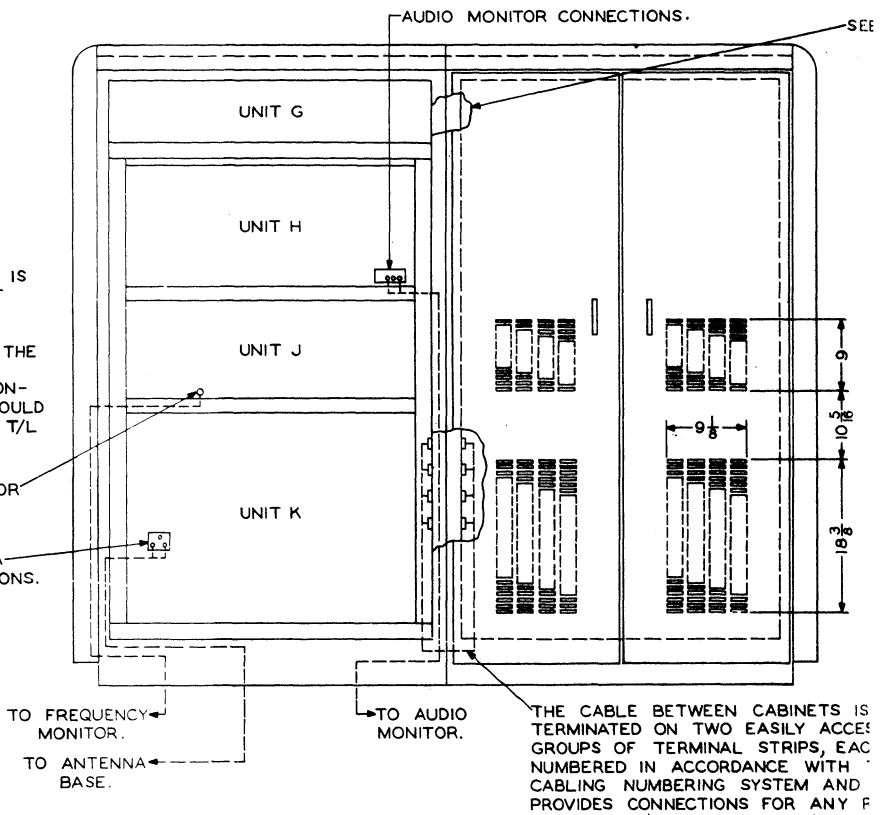
ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE INDICATED.

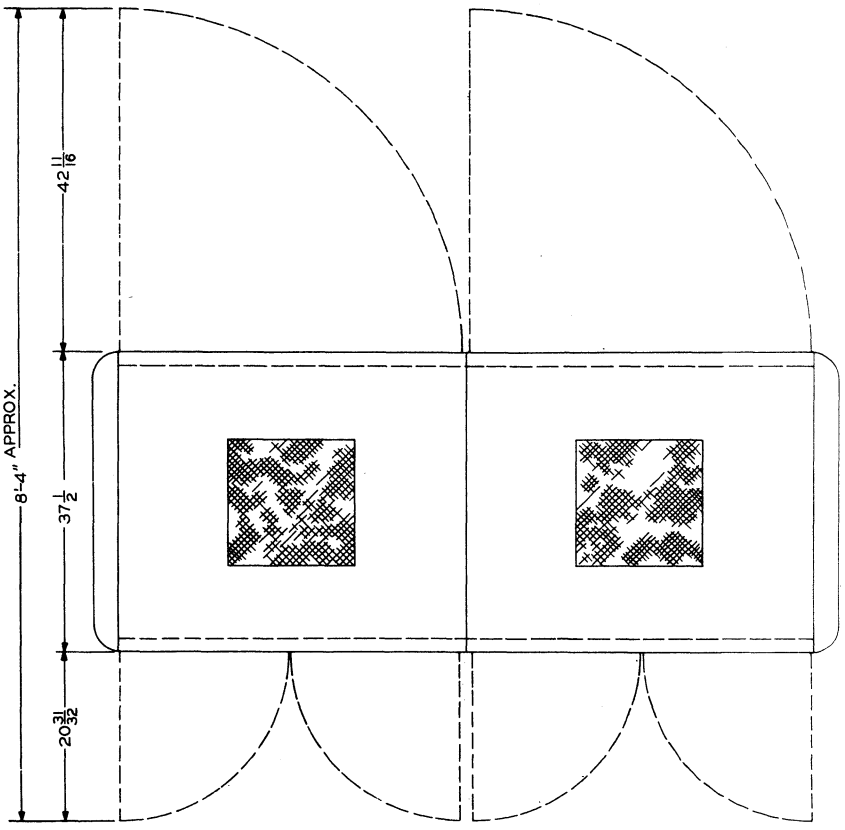
Figure 2-3 Transmitter Installation Layout

Figure 2-3 Transmitter Installation Layout

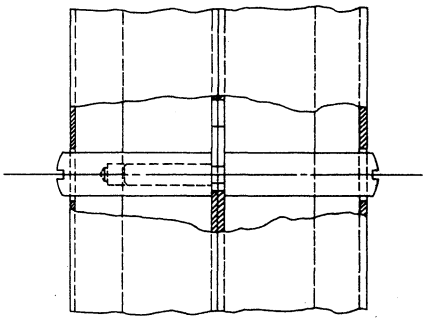


SIDE DUST COVERS: EACH ARE SECURED TO CABINET SIDE CHANNEL FLANGES BY MEANS OF 8-1/4-20 SCREWS. ADJUSTMENT AND ALIGNMENT IS PROVIDED FOR BY MEANS OF VERTICAL SLOTS IN FLANGES. CLEARANCE HOLES ARE PROVIDED FOR TIGHTNING SCREWS FROM INSIDE OF CABINET.

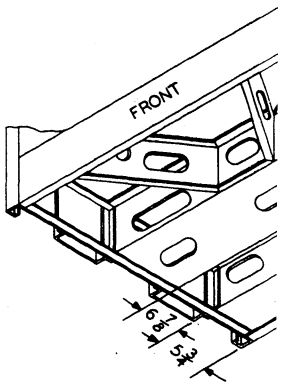


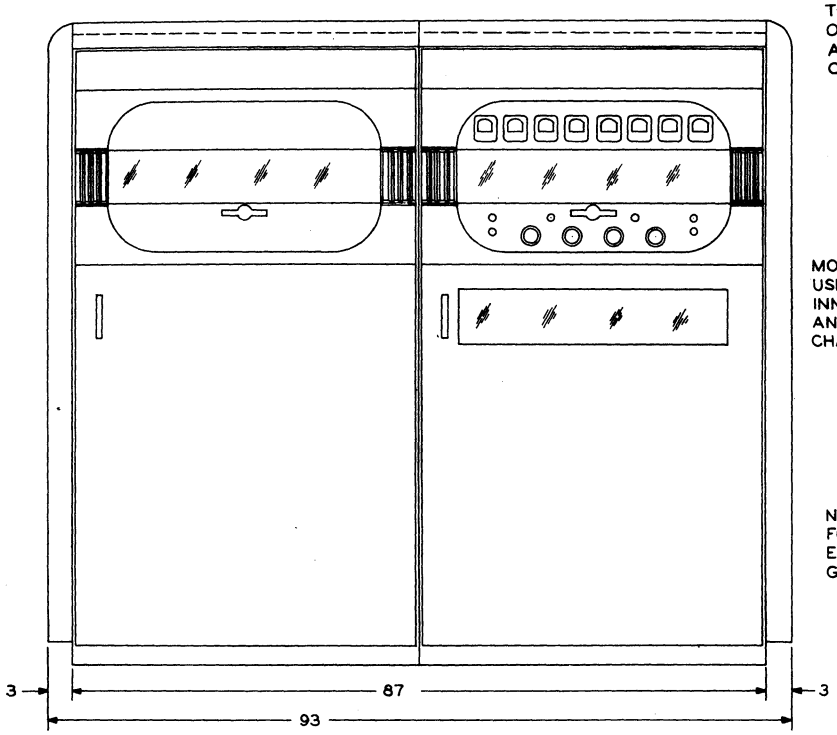


TOP VIEW SHOWING AIR OUTLETS AND DOOR CLEARANCES.



DETAIL "A"
METHOD OF FASTENING CABINETS TOGETHER.





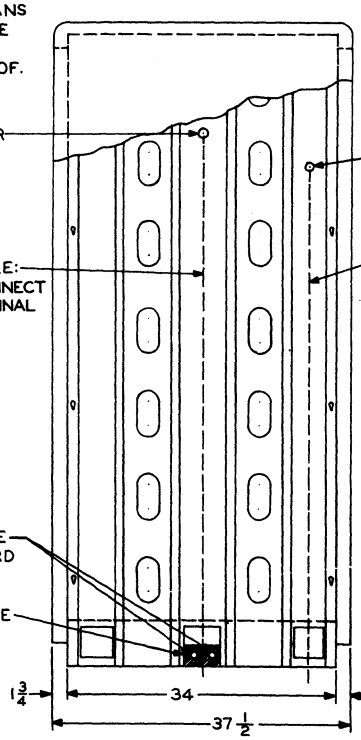
ROOF DUST COVERS ARE SECURED TO CABINET ROOF BY MEANS OF 4-10-32 SCREWS TO BE APPLIED FROM INSIDE (AT CORNERS) OF CABINET ROOF.

MODULATION MONITOR TERMINAL.

MODULATION MONITOR CABLE: USE SMALL COAX LINE. CONNECT INNER CONDUCTOR TO TERMINAL AND OUTER CONDUCTOR TO CHASSIS GROUND.

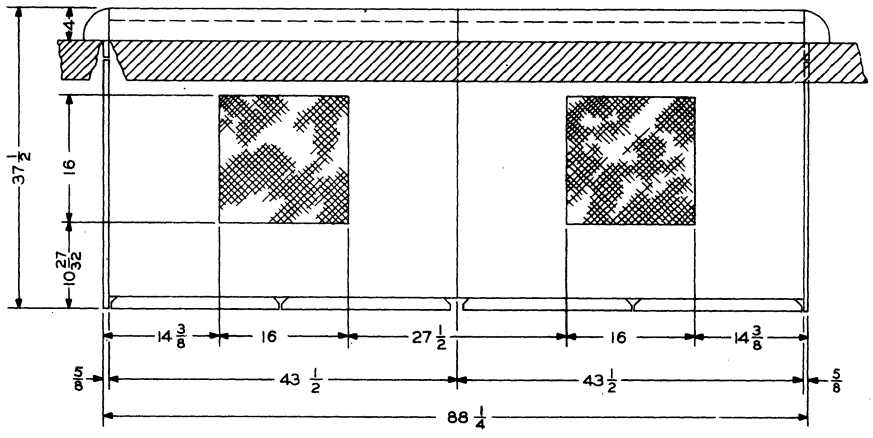
NOTE:
FOR CABINET GROUND USE EITHER 3" OR 4" STANDARD GROUND STRAPS.

METALIZED SURFACE

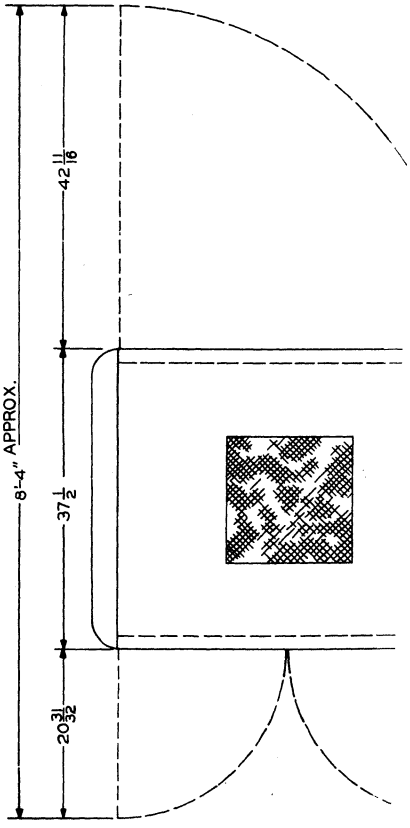


SIDE DUST COVERS: EACH ARE SECURED TO C
SIDE CHANNEL FLANGES BY MEANS OF 8-1/4-20
ADJUSTMENT AND ALIGNMENT IS PROVIDED FOR
OF VERTICAL SLOTS IN FLANGES. CLEARANCE H
PROVIDED FOR TIGHTNING SCREWS FROM INSIDE

OPTIONAL DUST COVER CONSTRUCTION FOR "IN THE WALL" MOUNTING.



DETAIL OF DUST COVER CONSTRUCTION FOR "IN-THE-WALL" MOUNTING OF CABINET.
NOTE: SIDE COVERS COME APART WITHIN WALL FOR EASE OF INSTALLING. HEIGHT TO TOP OF CABINET EXCLUDING THE TOP FRONT DUST COVER IS 78 INCHES.



TOP VIEW
AND DOOI

The order of designation of inter-unit cabling is as follows: When a wire terminates on a single numbered terminal on a unit, the wire route is from the source to the terminal on the specified unit and is indicated by the terminal number followed by the unit letter designation. There is a wire starting from terminal number 98 on Unit A which terminates on terminal number 98 of Unit E. Therefore, an arrow at terminal number 98 on Unit A indicates that the wire routes to terminal 98E, and the arrow is designated 98E. An arrow from terminal number 98 on unit E indicates that the particular wire in question is terminated on terminal number 98, Unit A. The designation at the end of the arrow is 98A.

Every wire within the transmitter, going between units or between cabinets, is given a number. Regardless of where this number appears, it is the same wire that carries that number in another unit. This provides easy means of tracing circuits and locating trouble. The cable between cabinets is arranged on two easily accessible groups of terminal strips, (refer to figure 2-4) each numbered in accordance with the cabling numbering system and provides connections for any remote control required or additional control circuits that might be desirable.

2.1.3. External Connections. (Refer to figure 2-3.)

(a) Power Connections. - The power input cable should be brought through the grommet hole to terminals 1, 2, 3 and grd. on the terminal strip. The power cable should have a rating of at least 30 amperes capacity. It is recommended that a main station switch be installed in the power line equipment at some location convenient to the transmitter, so that the power line may be completely disconnected before attempting any major servicing of the equipment.

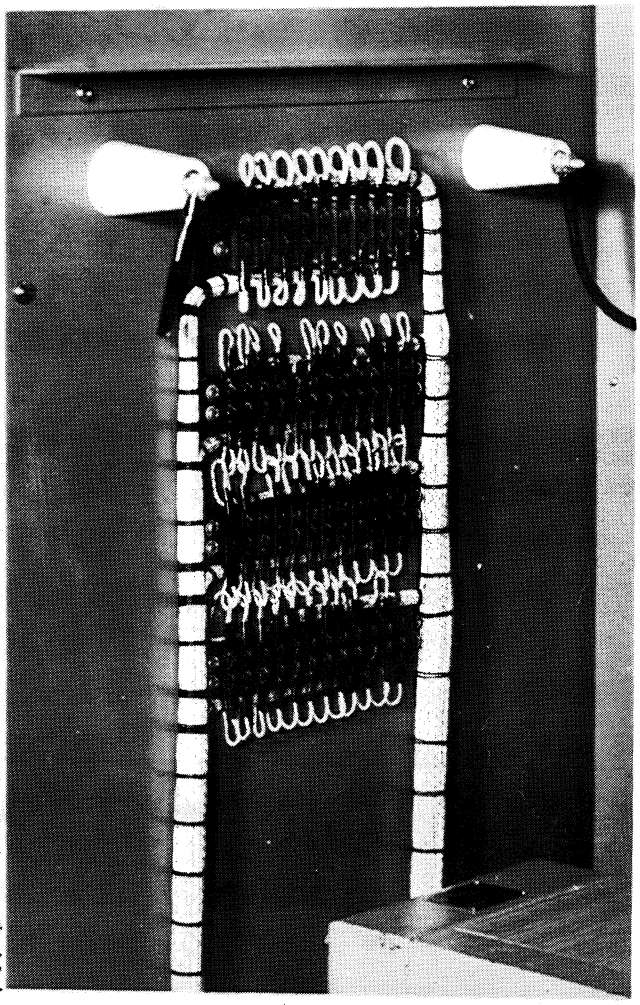


Figure 2-4 Inter-cabinet Cable Connector Panel

Terminals have been provided on the transmitter for the connection of a constant voltage transformer or an induction type voltage regulator. If the use of a voltage regulator is not necessary the terminals should be "jumpered" with bus wire as shown in figure 2-5. Terminal line 1 should connect to load 1, line 2 to load 2 and line 3 to load 3.

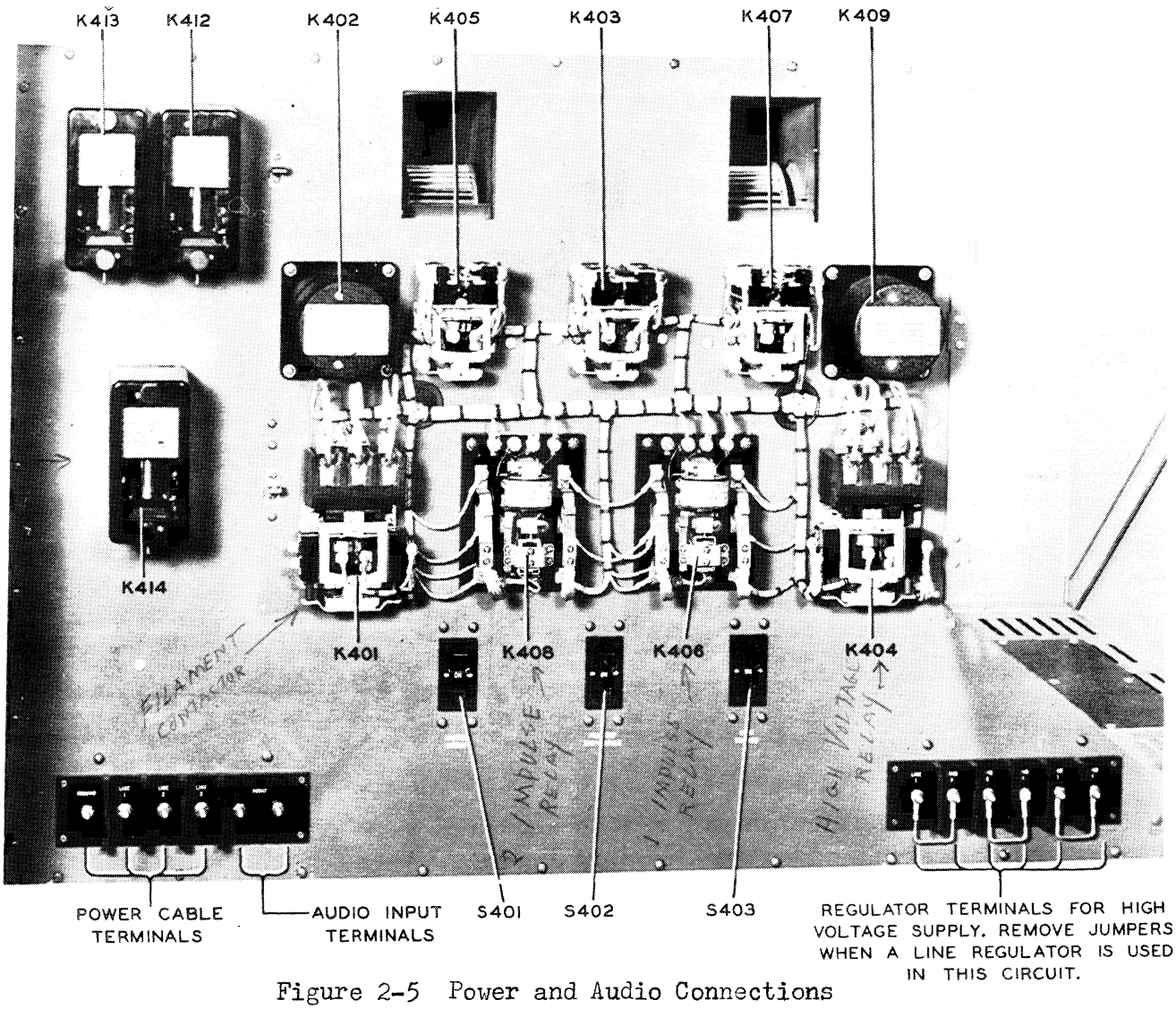


Figure 2-5 Power and Audio Connections

The crystal heat transformer T204 can be operated from either a 115 volt or 208/230 volt source. If the transformer is to be operated from a 115 volt source use terminals 1 and 2 of transformer T204. Disconnect the 208/230 volt source from terminals 10F and 11F of E205 and connect the 115 volt source to these terminals.

(b) Speech Input Connections. - The audio input connections to the transmitter are made to the two audio terminals located on the same terminal strip as the power connections. These connections should be made by means of a twisted pair shielded cable.

(c) Antenna Transmission Line Termination. - The transmission line may be carried up the cabinet channel and the outer conductor or ground connection fastened securely to the transmitter ground terminal. The inner conductor of the line should be connected to the T/L terminal standoff located near the top of the transmitter. Refer to figures 2-3 and 2-6 for location.

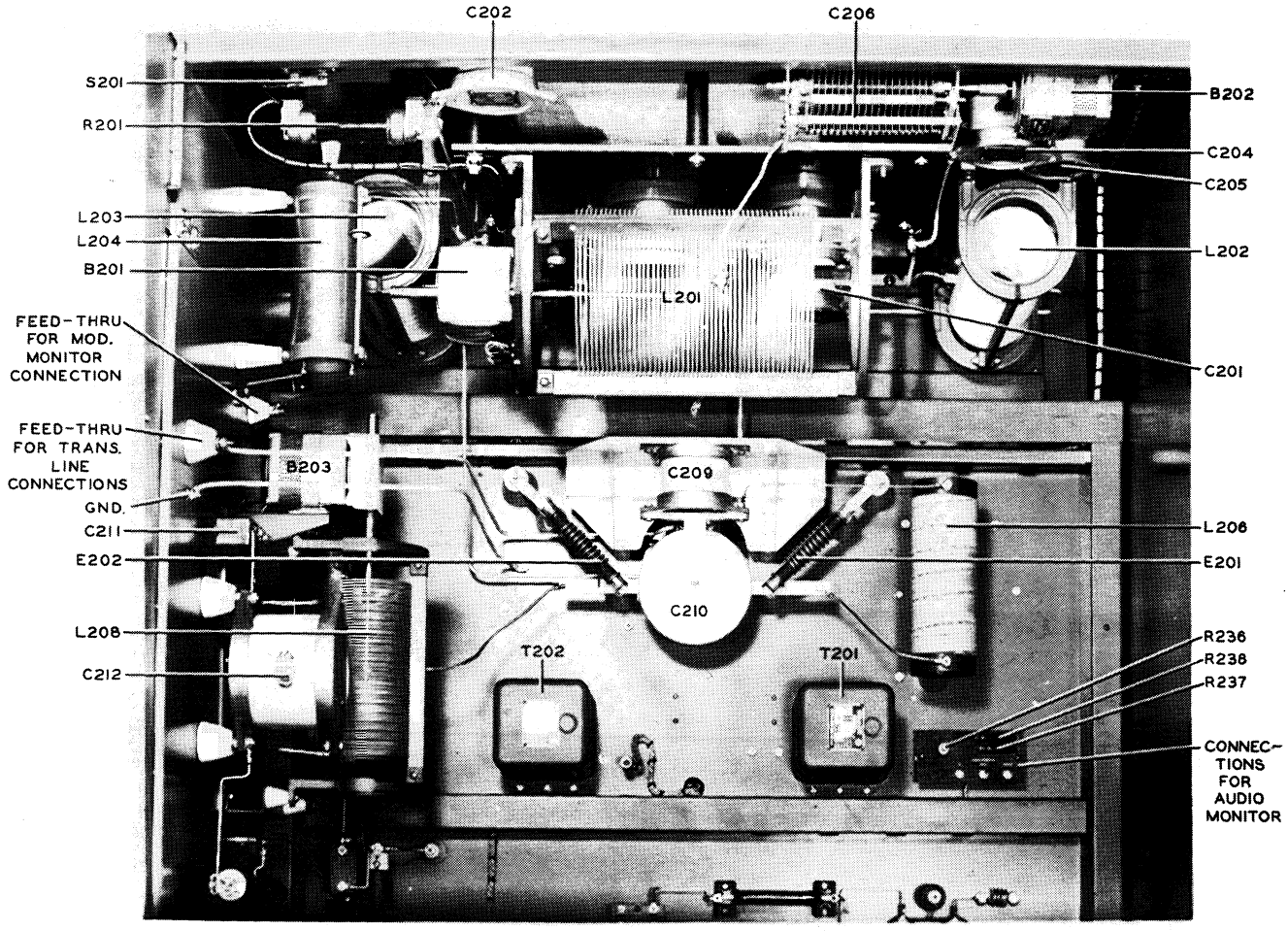


Figure 2-6 Transmission Line and Monitor Connections

(d) Monitoring Connections. - The modulation monitoring connection should be made to the isolantite feedthru located near the top of the R-F and Rectifier Bay. A twisted pair or small coax line should be used connecting one wire to the terminal and the other to a chassis ground.

The audio monitor connections can be made to the 600 ohm - 150 ohm pad terminals located on the vertical chassis of the R-F and Rectifier Bay.

The frequency monitoring connections have been brought out to an isolantite feedthru on the rear of the vertical chassis of the R-F and Rectifier Bay.

(e) Remote Antenna Current Connectors. Connections have been brought out to a terminal board located in the rear of the vertical chassis of the rf and rectifier bay. Connect the line to these terminals for measuring the remote antenna current.

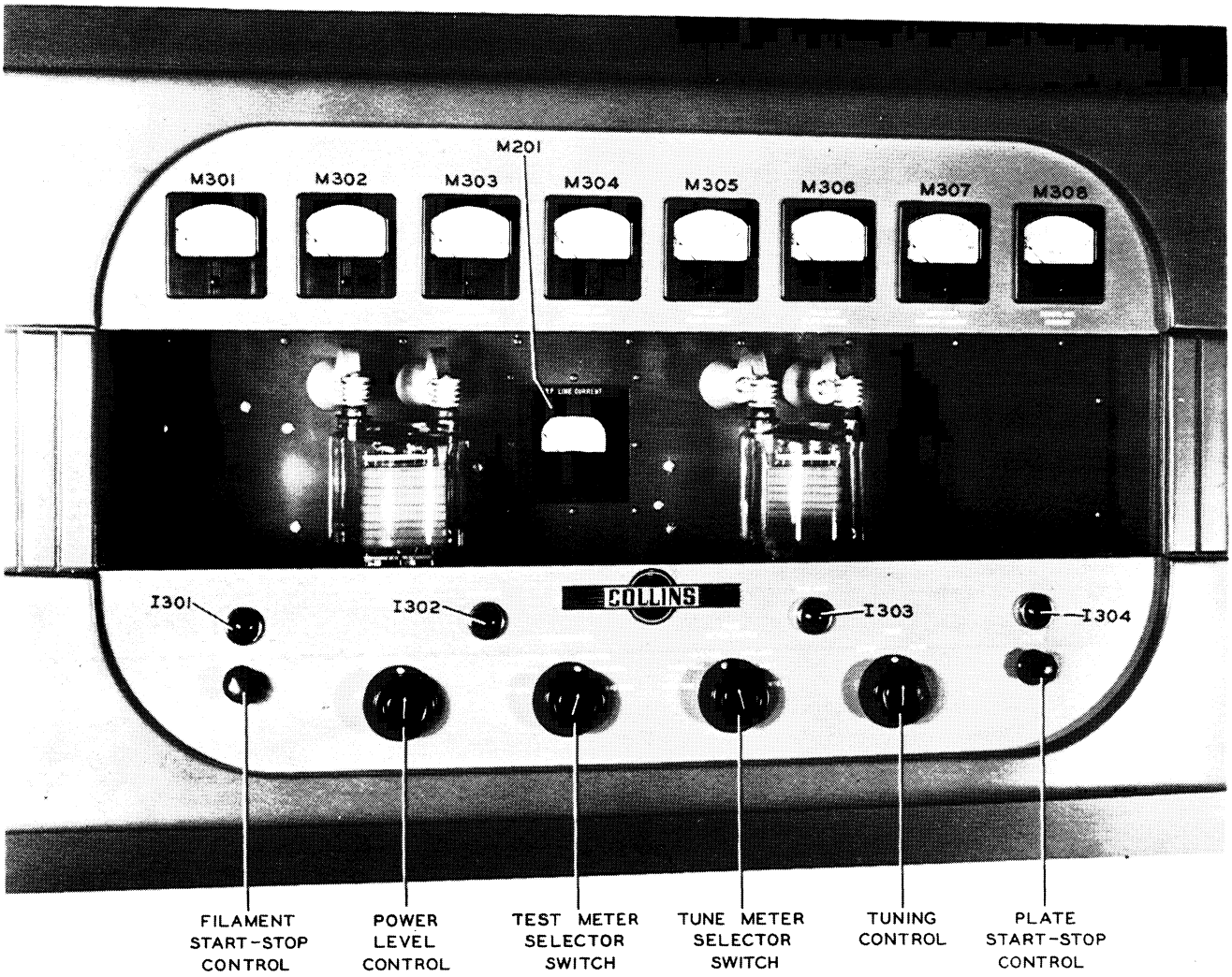


Figure 2-7 Meter and Control Panel

2.2. INITIAL ADJUSTMENTS.

2.2.1. General. - The 20T transmitter is operated from controls located conveniently on the front of the transmitter. Refer to figure 2-7. The control panel is mounted on the front door of the R-F and Rectifier Bay and consists of a Filament Power Control, a Plate Power Control, a Power Level Switch, a Test Meter Selector Switch, a Tune-Meter Selector Switch and a Tuning Control. Three magnetic Circuit Breakers, S401, S402 and S403, are located on the vertical chassis of the Audio and Control Bay. Refer to figure 2-5.

2.2.2. Function of Controls. (Refer to figure 2-8.)

(a) Control Circuit Breaker. - This circuit breaker, S401, when closed applies the voltage for the operation of the relays of the control circuit.

(b) Filament and Low Voltage Circuit Breaker. - This circuit breaker, S402 must be closed before filament or low voltage power can be applied to the transmitter.

(c) High Voltage Circuit Breaker. - This circuit breaker, S403, when closed

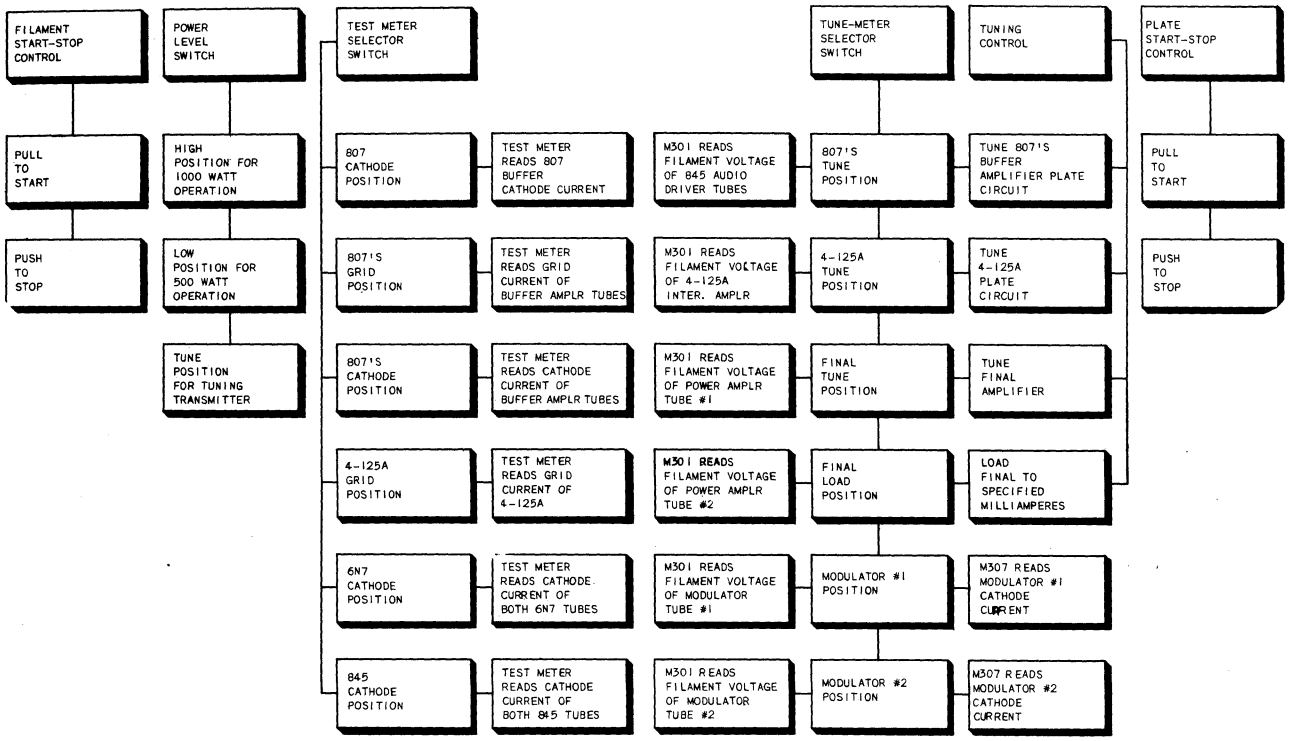


Figure 2-8 Control Panel Operations

before high voltage can be applied to the modulators, intermediate and power amplifier tubes.

(d) Filament Start-Stop Control. - This control is PULLED TO START AND PUSHED TO STOP. When the control is pulled a sequence of relay operations will begin, which will energize the tube filaments, blower motors, and the low voltage plate transformer. The transmitter may be completely shut down by pressing this control.

(e) Power Level Switch. - This switch controls the output level of the transmitter. In the high position the transmitter has an output of 1.0 to 1.1 KW. With the switch in the low position the plate voltage of the power amplifier is lowered and the transmitter output is reduced to half power. With the switch in the tune position the plate voltage to the final tubes remains the same as in the low position.

In addition to this, the screen voltage of the intermediate amplifier is removed and the screen of the tube is grounded.

(f) Test Meter Switch. - The test meter switch has six positions. When used in conjunction with the test meter it enables the operator to read the cathode current of the 807 buffer and buffer amplifier tubes, the cathode current of the 6N7 and 845 audio tubes and the grid current of the parallel 807's and the 4-125A tubes.

(g) Tune-Meter Selector Switch. - The tune-meter selector switch has six positions. The voltage applied to the filaments of the modulator, audio driver, intermediate and power amplifier tubes, can be read utilizing the tune-meter switch and the filament's voltmeter. This switch is also used to select different circuits to be metered for the

proper tuning and loading of the transmitter.

(h) Tuning Control Switch. - This switch controls the operation of the tuning motors.

(i) Plate Power Start-Stop Control. - This control is pulled to start and pushed to stop. Pulling this control after the filaments and low voltage plate transformer have been energized, will apply the high voltage to the plates of the modulator, the intermediate amplifier and the final tubes. The plate start-stop control is also arranged so that by pulling the plate start button, before the filament starting circuit is energized, the transmitter will come on in sequence in the least possible time that the time delay relays in the control circuit will allow.

2.2.3. Energizing the Equipment for the First Time.

(a) PRECAUTIONS. - Before energizing the equipment, a thorough inspection of all connections and terminals should be made to assure freedom from faulty operation. Do not insert the tubes in the transmitter. Tube plate leads and caps should be checked for clearance to any metal object and tied to some convenient support to prevent accidental short circuits when checking operation of the plate voltage control circuit.

Inspect all door interlocks making certain that the male member is free by pressing on the contact block until the spring is completely compressed and then releasing the pressure. If the contact block does not spring out to its initial position, check the two wires comprising the arm for parallelism, adjusting the wire arms until they are free of the stop pin located between the two wires. Before applying power to the transmitter input, be certain that all circuit breakers are in the off position. These precautions having been taken, the circuit to the transmitter can be energized.

(b) Power Circuit Check.

(1) Energize the circuit to the transmitter.

(2) Close the circuit breaker marked CONTROL CIRCUIT.

(3) Close the circuit breaker marked FILAMENT - LOW VOLTAGE.

(4) Close the cabinet doors.

(5) Pull the FILAMENT Start-Stop Button.

The filament relay, K401, should now be energized and held operated through its own holding contacts. The closing of the filament relay should light the filament pilot lamp, start the ventilating blowers, energize the time delay relay, K402, energize the constant voltage transformers and apply power to the filament transformer primaries of all tubes in the transmitter. When approximately 30 seconds have elapsed, the time delay relay should operate. If the time necessary for the operation of this relay is not within 10% of the 30 second limit, the time of operation should be adjusted. The field coil of the 807's tuning motor and the low voltage transformer will be energized immediately following the closing of the low voltage relay. Operation of the time delay relay completes the circuit necessary for the operation of the low voltage relay.

(6) Rotate the TUNE-METER switch to all six positions and check the voltage on the FILAMENT VOLTAGE meter. When the tubes are not in the sockets, the voltage readings will be only approximately correct because no power is being drawn

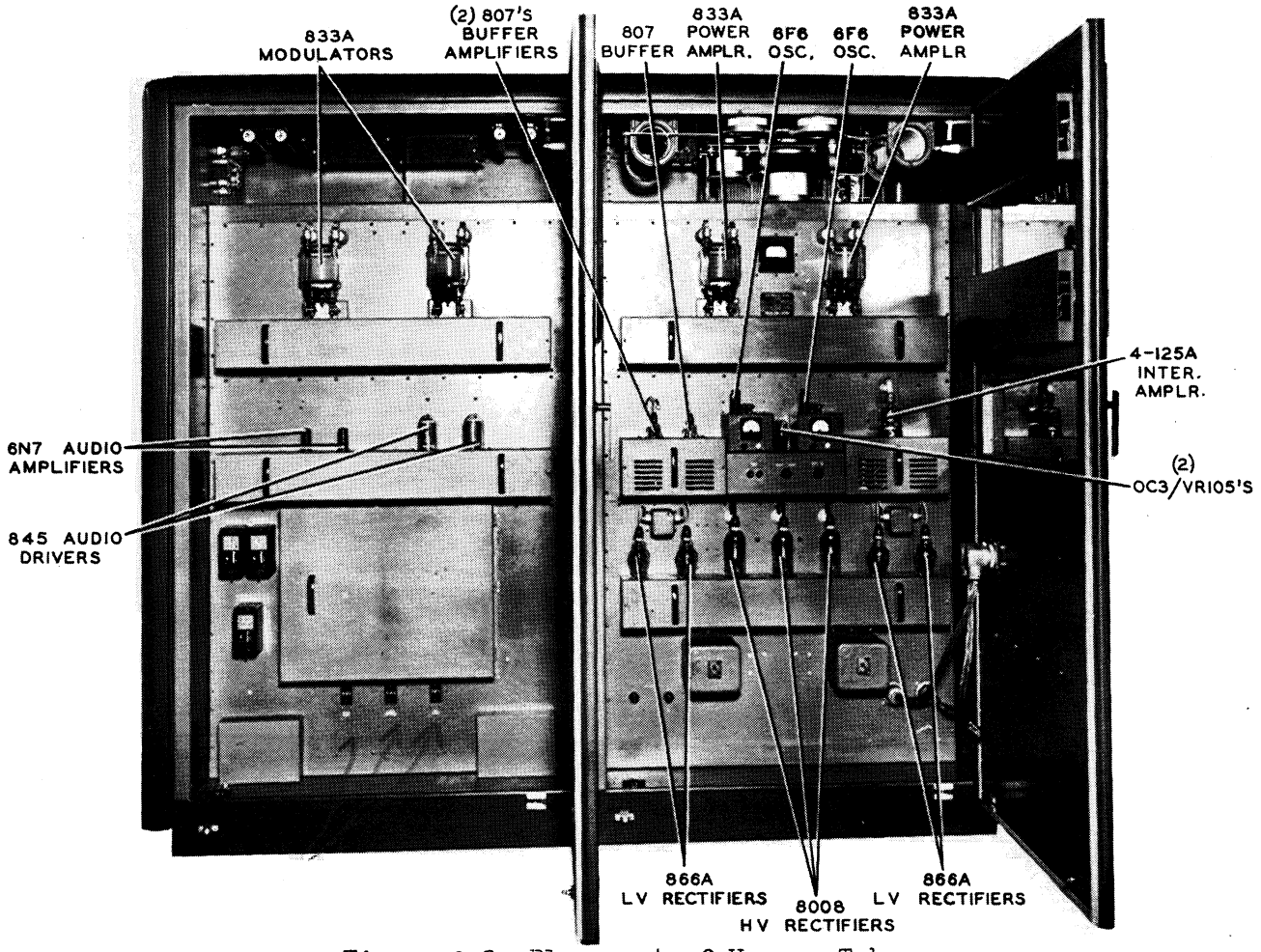


Figure 2-9 Placement of Vacuum Tubes

from the transformer secondaries. If voltage readings are obtained in all positions of the TUNE-METER SWITCH and the readings are reasonably correct for the circuit being metered the power circuit check may be continued.

(7) Close the circuit breaker marked HIGH VOLTAGE.

(8) Close the cabinet doors.

(9) Pull the PLATE start-stop button. The high voltage plate relay, K404, will operate and be held in the operated position through its own holding contacts, the O/L auxiliary relay contacts, K407-1, the low voltage relay contacts, K403-1, and the plate stop switch. The closing of the high voltage relay will light the PLATE pilot lamp, energize the high voltage transformer and energize the field coils of the three remaining tuning motors.

When the above preliminary tests have been completed, shut off the transmitter by pressing the FILAMENT start-stop button. The tubes may now be inserted in their sockets. Refer to figure 2-9 for the tube locations.

2.2.4. Filament Circuit Adjustment. - All filament transformers are provided with tapped primary windings to facilitate raising or lowering the secondary voltage. Filament voltages should be ad-

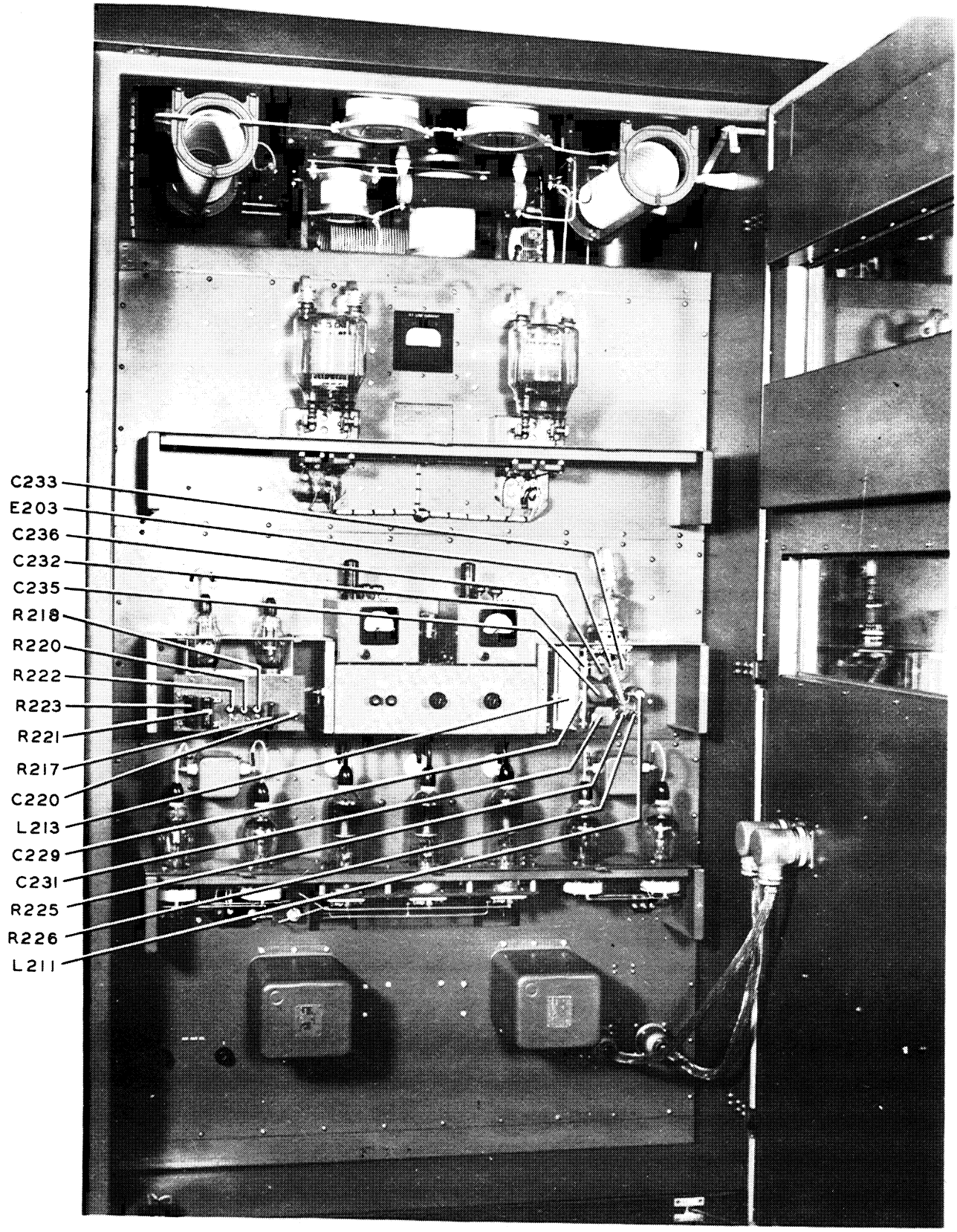


Figure 2-10 R.F. and Rectifier Bay - Inside Front View

justed to within 5% of the value recommended for the type of tube used. To permit the proper aging of the mercury vapor rectifier tubes, the filaments should be excited for a period of thirty minutes before the application of any plate power. This can be accomplished by allowing one of the cabinet doors to remain open with the filaments of the tubes excited, thus preventing the operation of the low voltage relay during the aging process. This aging procedure is required only in the case of new tubes. In subsequent operating procedure, the time delay relay will automatically provide the proper time interval. The filament volt meter, M301, is used in conjunction with the tune-meter switch for measuring the filament voltage applied to the tubes. The following table lists the tubes, function, tune-meter switch position, correct voltage and the filament transformer for each tube. If the filament voltage of any tube or tubes is not within 5% of the value given, adjust the taps on the respective filament transformers to give the correct filament voltage.

2.2.5. Tuning Adjustment. - OPERATION OF THIS EQUIPMENT INVOLVES THE USE OF HIGH VOLTAGES WHICH ARE DANGEROUS TO LIFE. OPERATING PERSONNEL SHOULD AT ALL TIMES OBSERVE ALL SAFETY PRECAUTIONS. DO NOT CHANGE TUBES OR MAKE ADJUSTMENTS INSIDE THE EQUIPMENT WITH THE HIGH VOLTAGE SUPPLY ON. DO NOT DEPEND UPON DOOR SWITCHES OR INTERLOCKS FOR PROTECTION. ALWAYS SHUT DOWN POWER EQUIPMENT WHEN MAKING ADJUSTMENTS.

(a) Oscillator Adjustment. - The oscillator is of the untuned type and no adjustment is available except a trimmer capacitor in the grid circuit. The frequency may be varied over a range of ±10 to 20 cps by adjusting this trimmer capacitor.

Should it be found necessary, the frequency may be adjusted over a range of two to three hundred cycles by means of the airgap in the crystal holder. (Refer to figure 2-15.) This adjustment is made by removing the name plate from the top of the holder and using a special type 280A wrench. Loosen the locknut and rotate the airgap regulator very slightly. Clockwise rotation lowers the frequency, counterclockwise rotation increases the frequency. When the adjustment has been completed, tighten the locknut and replace the name plate.

Either Oscillator Unit may be selected by the Oscillator Selector Switch, S203.

(1) Rotate the CRYSTAL HEAT switch, S202, to the ON position.

(2) Close the CONTROL circuit breaker and the LOW VOLTAGE and FILAMENT circuit breaker.

Tube Type	Function	Tune-Meter Switch Position	Filament Transformer	Recommended Voltage
845	Audio Driver	807's TUNE	T405	10.0
4-125A	Int. Amplifier	4-125A TUNE	T203	5.0
833A	Power Amp.	FINAL TUNE	T201	10.0
833A	Power Amp.	FINAL LOAD	T202	10.0
833A	Modulator	MOD. 1	T401	10.0
833A	Modulator	MOD. 2	T402	10.0

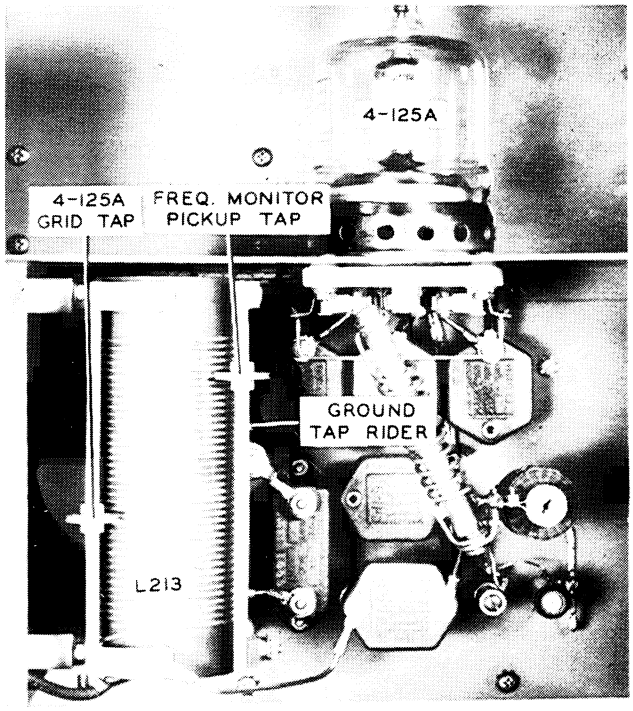


Figure 2-11 Buffer Amplifier Plate Tank Inductor

(3) Rotate the POWER level control to the TUNE position.

(4) Pull the FILAMENT start-stop control. As soon as the time delay relay operates, the plate and screen voltage will be applied to the oscillator.

The normal operating current of the 6F6 oscillator tube is between 10 and 27 ma. The value of this current depends on the frequency of operation. The higher the frequency used the higher will be the operating current.

(b) Buffer Amplifier Grid Adjustment. - When proper operation of the oscillator has been secured:

(1) Rotate the TEST selector switch to the 807's GRID position.

(2) Adjust the buffer grid coupling capacitor, C220, until the test meter indicates 5 to 6 ma, of grid current.

(c) Buffer Amplifier Plate Tuning.

(1) Rotate the TEST selector switch to the 807's CATH. position.

(2) Rotate the TUNE METER SELECTOR switch to the 807's TUNE position and operate the tuning control. The cathode current will dip sharply when the point of resonance is reached. If the point of resonance cannot be found it will be necessary to change the tap on inductor, L213. Refer to figure 2-11 for the location of the inductor.

(3) Change the tap in steps of not more than two turns at a time until resonance is established with the tuning capacitor at approximately one-half capacity.

(d) Intermediate Amplifier Grid Adjustment. - The tank inductor, L213 is provided with a sliding connector to vary the degree of loading of the buffer amplifier plate circuit and the coupling to the grid of the intermediate amplifier tube. Refer to figure 2-11.

(1) Rotate the TEST SWITCH to the 4-125A GRID position.

(2) Read the intermediate amplifier grid current as indicated on the TEST METER. If the grid current is not within the range of 20 ma to 25 ma adjust the rider on L213 until this value has been obtained. (When plate and screen voltage is applied to the int. amp. tube the grid current should be about 13 ma).

(3) Adjust the rider in steps of not more than 2 turns at a time. To increase the drive, move the tap toward the plate end of the coil.

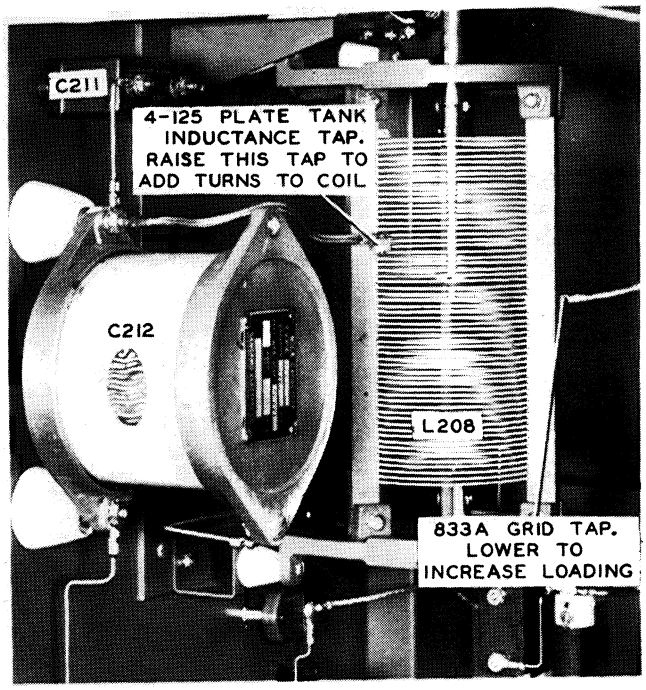


Figure 2-12 Intermediate Amplifier Plate Tank Inductor

(4) Retune the buffer amplifier plate circuit to establish resonance after each tap change.

(e) Intermediate Amplifier Plate Tuning.- Before attempting to tune the intermediate amplifier plate circuit:

(1) Open switch S201, figure 2-6, located in the plate lead of the power amplifier.

(2) Remove the power amplifier grid tap from L208. (By removing this tap a better indication of resonance may be obtained.)

(3) Rotate rheostats R229 and R230 to the full counterclockwise position for a temporary bias adjustment of the modulator tubes. The intermediate amplifier plate circuit may now be tuned.

(4) Close the HIGH VOLTAGE circuit breaker.

(5) Rotate the TUNE-METER SWITCH to the 4-125A TUNE position. The POWER switch should remain in the TUNE position.

(6) Pull the PLATE start-stop control.

(7) Operate the TUNE control. Tune for minimum cathode current of the intermediate amplifier as indicated by a slight dip on meter M303. If the point of resonance cannot be found it will be necessary to adjust the tap on inductor L208. Refer to figure 2-12. Change the tap in steps of not more than 2 turns at a time until resonance has been established.

(8) Rotate the POWER switch to the LOW position to complete the tuning.

(f) Final Amplifier Grid Adjustment.- When resonance has been established in the plate circuit of the intermediate amplifier, the final amplifier grid tap can be replaced on inductor L208. This adjustable tap varies the degree of loading of the intermediate amplifier plate circuit and the coupling to the grids of the final amplifier tubes.

(1) The POWER switch remains in the LOW position.

(2) Adjust the setting of the tap on the L208 at the ground end of the inductor. Increase coupling in steps of not more than 2 turns at a time.

(3) Check the final amplifier grid current after each tap change.

(4) Retune the intermediate amp plate circuit to resonance after each tap change.

(5) The tap should be adjusted so that at resonance the final amplifier

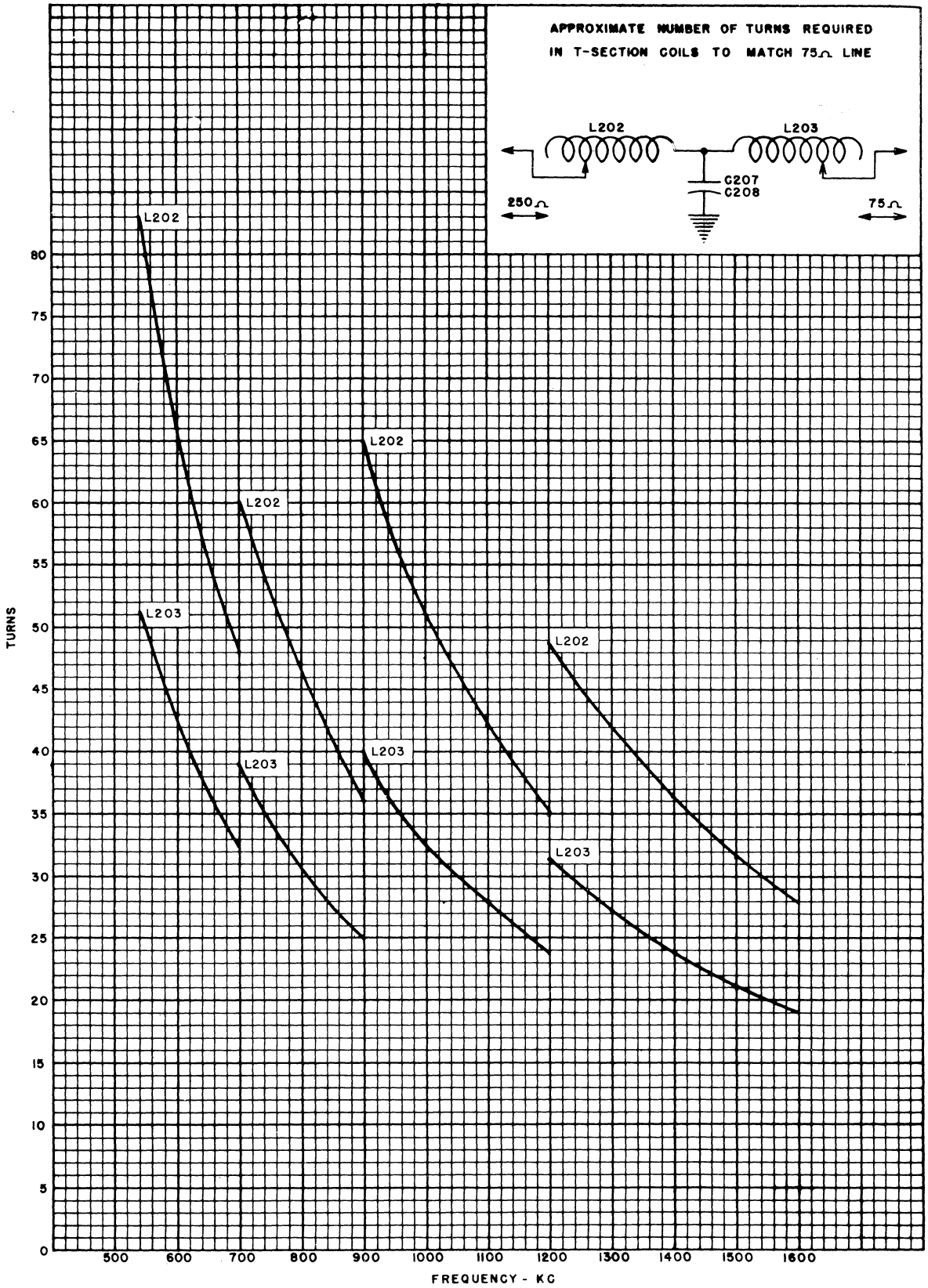


Figure 2-13 Output T Section Inductance Chart

grid current is approximately 220 ma with the power lever switch in the LOW position and the high voltage off the plates of the final amplifier tubes. The plate of the 4-125A tube should now show a slight red color.

(g) Neutralization. - The final amplifier has been neutralized and locked at the factory and no further adjustment should be required. However, due to the slight difference in the interelectrode capacity of various type 833A tubes some adjustment of the neutralizing capacitor may be necessary. An oscilloscope may be used to indicate complete neutralization of the final amplifier circuit. The high voltage lead to the plates of the final amplifier tubes should be broken by opening switch S201. Inductively couple the oscilloscope to the final pi tank coil, L201, to obtain sufficient r-f pick-up. Pull the PLATE start-stop control to apply filament and plate voltage to the r-f stages preceding the final amplifier. Tune the plate circuit of the final amplifier to as near resonance as can be determined without application of the plate voltage. Maximum indication of r-f feedthru on the oscilloscope should appear under this condition. Adjust the coupling to give the desired pick-up. Neutralization adjustments may now be made. The neutralizing capacitor should be adjusted to give a minimum r-f indication on the oscilloscope.

(h) Final Amplifier Plate Tuning.

(1) Make approximate settings of the output network by referring to tuning chart figure 2-13.

(2) Close the switch, S201, located in the plate lead of the final amplifier tubes.

(3) Rotate the TUNE METER SWITCH to the FINAL TUNE position.

(4) Rotate the POWER switch to the HIGH position.

(5) Pull the PLATE start-stop control.

(6) Operate the TUNING control. Tune for minimum plate current as indicated on meter M305. If the point of resonance cannot be reached, adjust the tap on the plate tank inductor, L201 until resonance is established.

(i) Loading Adjustments. - All inductor tap adjustments of the output network have been made for the frequency upon which the transmitter is to operate, in accordance with the curves in figure 2-13, so that only slight adjustment of the inductor taps should be necessary. If the load impedance is higher than 75 ohms, the output coil will require more inductance than that indicated by the graph. If the load impedance is less than 75 ohms, the reverse procedure should be followed.

The variable loading condenser should be set at mid range while the T section is adjusted to provide proper loading for full power operation. When operated in the HIGH power position, the normal operating power amplifier plate current is approximately 615 ma.

(1) Rotate the TUNE METER SWITCH to the FINAL LOAD position.

(2) The POWER switch remains in the HIGH position.

(3) Apply voltage to the final amplifier tubes.

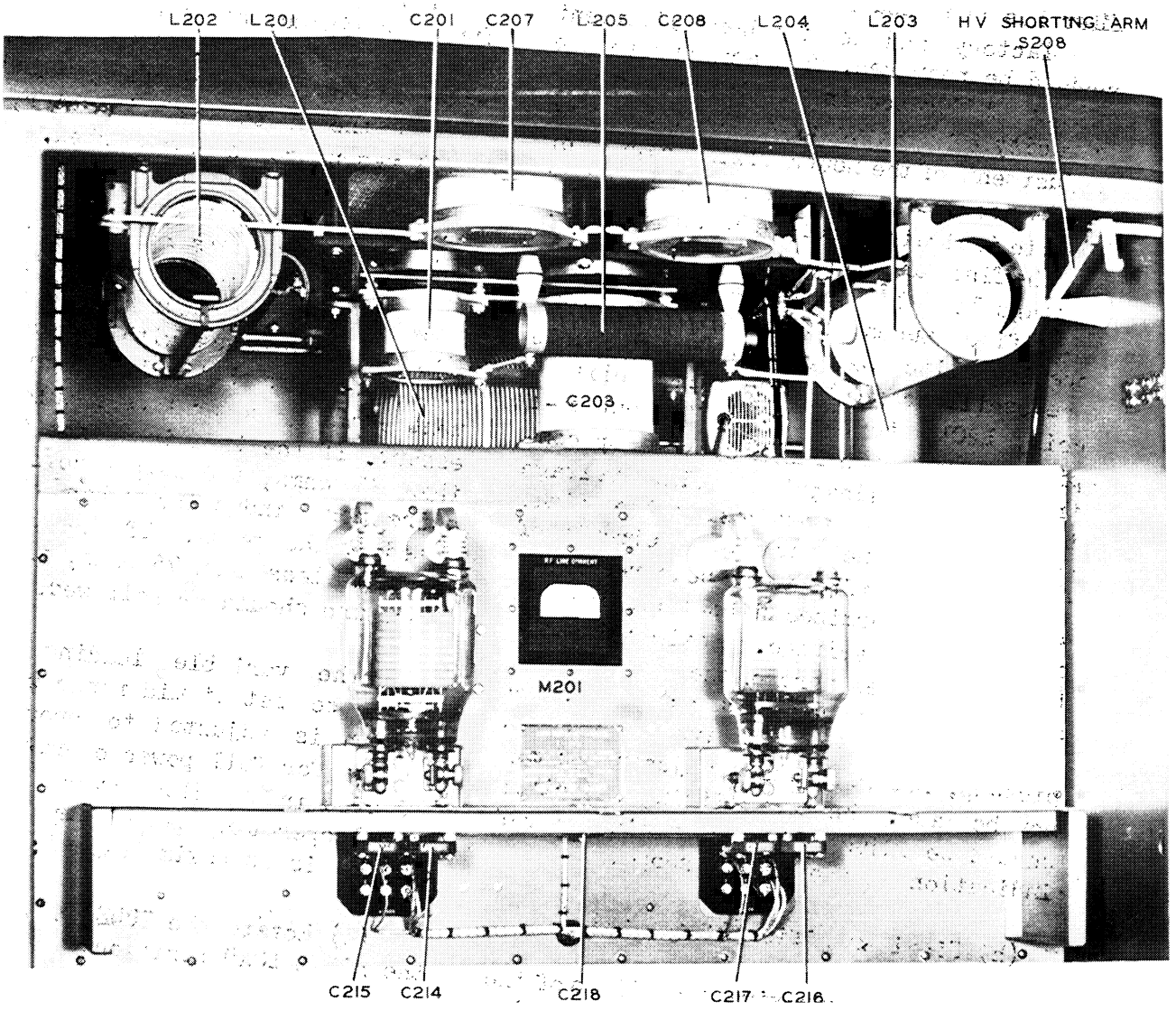


Figure 2-14 Radio Frequency Output Network Front View

(4) Operate the TUNE control, and attempt to load the power amplifier to about 80% of the full load.

(5) To decrease the loading, lower the inductance of the output coil L203 of the T section and increase the inductance of the input coil L202 a similar amount. To increase the loading, the procedure is the opposite of the above.

(6) To complete the adjustment of the T section, set the tap on the output branch to give a maximum antenna line current. When the above conditions have been obtained, a slight adjustment of power amplifier plate tank circuit is necessary. To make this adjustment, rotate the TUNE METER SELECTOR switch to the FINAL TUNE position and operate the tuning control until the tank circuit is set at resonance.

(7) Now detune the plate circuit slightly to one side of this setting. The plate current and the line current will now increase as will the plate efficiency.

The loading and tuning controls should be adjusted for maximum efficiency for the desired output. Observation of the color of the final amplifier plates will be a definite aid in making this adjustment. The apparent amount of detuning required to obtain the proper operating point will be greater for lower frequencies.

This procedure of detuning the plate circuit slightly off resonance is necessary because the variable element in the final amplifier plate circuit is in the inductive branch, and merely tuning to minimum plate current does not tune the plate circuit to unity power factor. Strictly speaking, minimum plate current may be used as an accurate measure of unity power factor only when the capacity of the tank is the element varied. The tuning adjustment of the 20T varies the inductance of the tank coil by means of a copper disc within the tank coil, and acts as a single short circuited turn. In this case maximum impedance will not occur at unity power factor, and L201 should be adjusted to a value slightly different than that which produces minimum plate current. This procedure will result in a higher plate efficiency in the final amplifier than would be obtained by tuning to minimum plate current.

(j) Audio Circuit Adjustments. - The only audio system adjustment necessary is that of the grid bias adjustment on the modulators. The bias should be adjusted to give a static plate current of approximately 30 ma for each tube.

(1) Rotate the TUNE-METER SWITCH to the MOD. 1 position.

(2) Pull the PLATE start-stop control to apply plate voltage to the modulators.

(3) Rotate rheostat R230 until the bias is adjusted to give the recommended value of static plate current for the No. 1 modulator tube. (Rotate clockwise to increase, counterclockwise to decrease the plate current.)

(4) Rotate the TUNE-METER SWITCH to the MOD. 2 position and rotate rheostat R229 until the bias is adjusted to give the recommended value of static plate current for the No. 2 modulator tube.

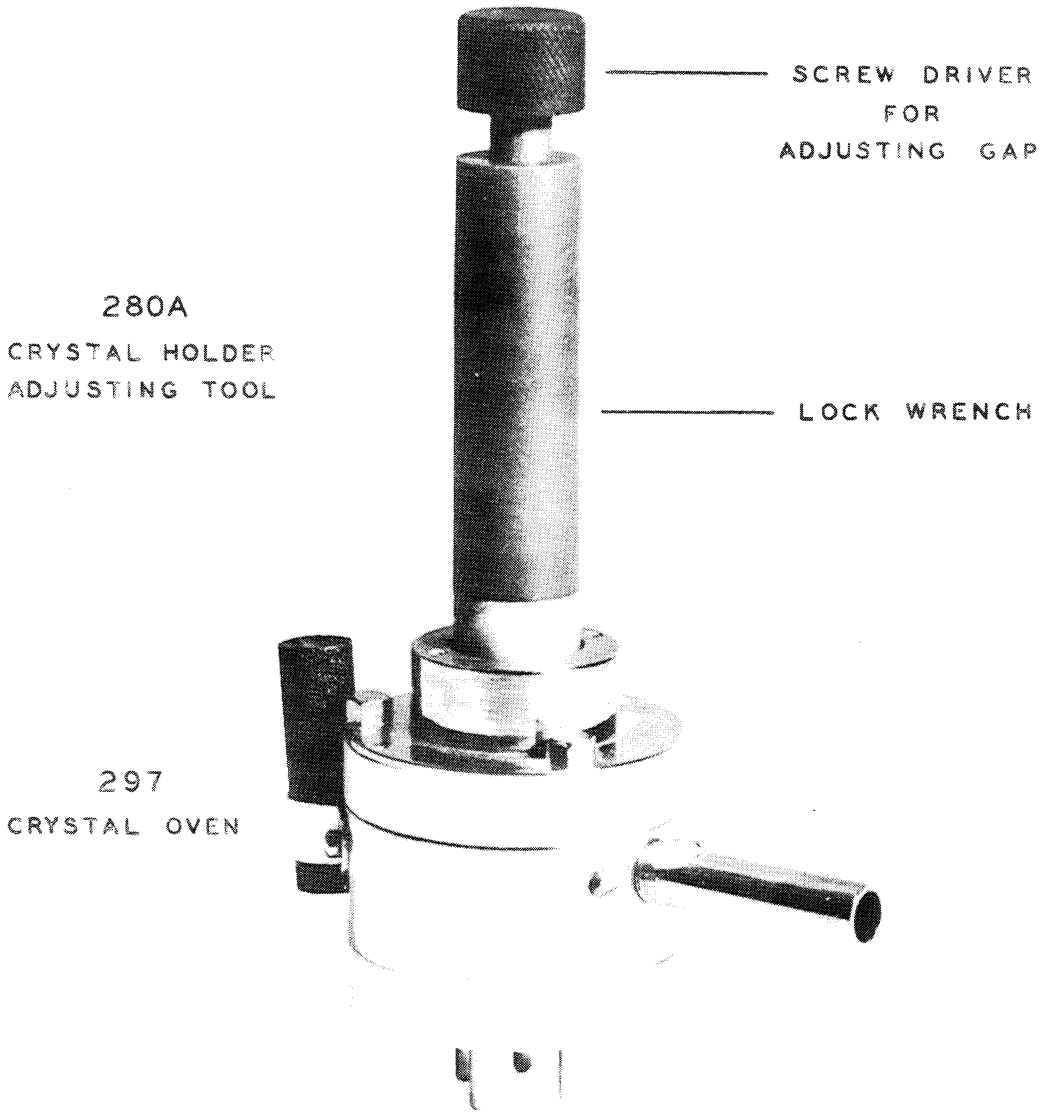


Figure 2-15 Type 280A Crystal Holder Adjusting Tool

SECTION 3

THEORY OF OPERATION

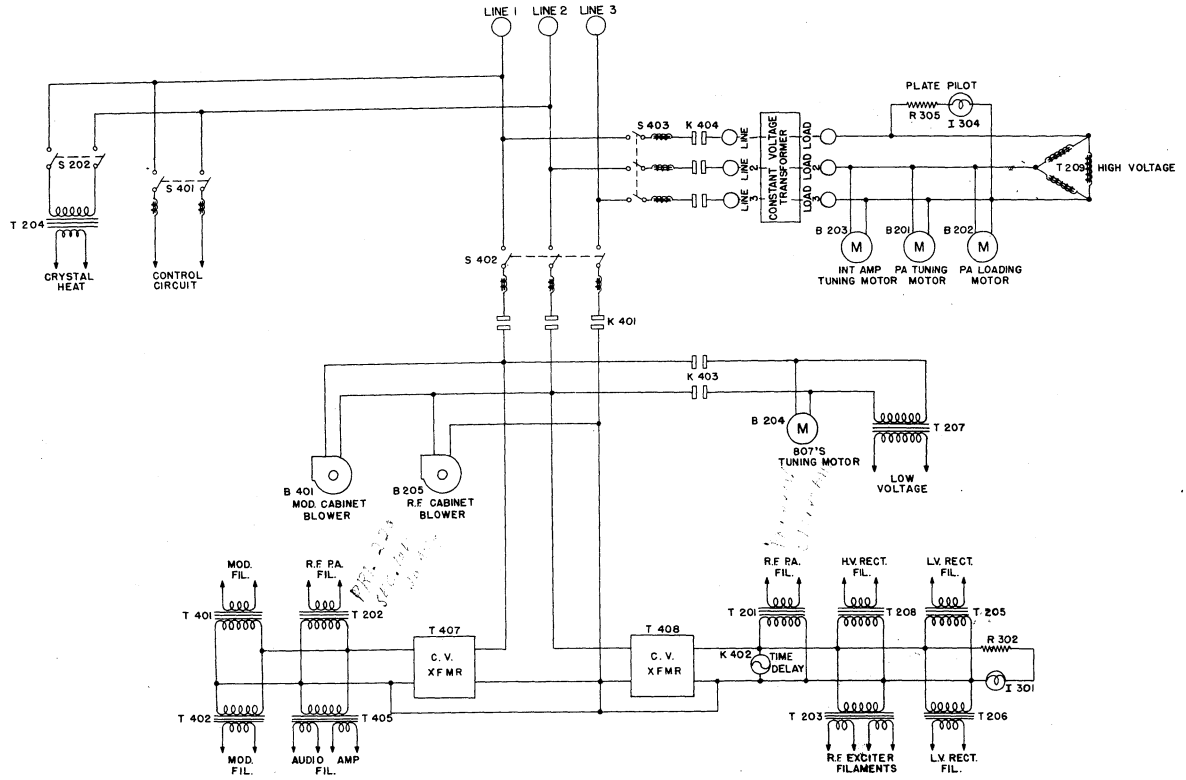


Figure 3-1 Simplified Primary Power Circuit

3.1. PRIMARY POWER CIRCUITS.

3.1.1. Primary Power Control Circuit. - Refer to figure 3-1. The 20T transmitter requires either 208 or 230 volts 3 phase 60 cycle power for operation. Three magnetic circuit breakers, (1) Control Circuit, (2) Filament and Low Voltage Circuit, (3) High Voltage Primary, control the major power circuits of the transmitter. Each circuit breaker serves two purposes: To isolate the major circuit and provide a-c overload protection.

(a) Power is supplied for operation of the relays in the control circuit through the circuit breaker S401.

(b) All filament transformers, the constant voltage transformers, the filament pilot lamp, the time delay relay K402 and the blower motors are energized through the contacts of the filament control relay K401 and the filament low voltage circuit breaker S402. The low voltage plate transformer T207 and the field coil of the 807's tuning motor, B204, are energized through the power contacts of the low voltage plate relay K403, the contacts of relay K401 and the circuit breaker S402. The time delay relay K402 allows sufficient time for the filaments of all tubes in the transmitter to warm up to the operating temperature before the plate voltage can be applied.

(c) The high voltage plate transformer, T209, the plate pilot lamp, a line voltage regulator (optional) and the field coils of tuning motors B201, B202, B203, are energized through the power contacts of relay K404 and the circuit breaker S403.

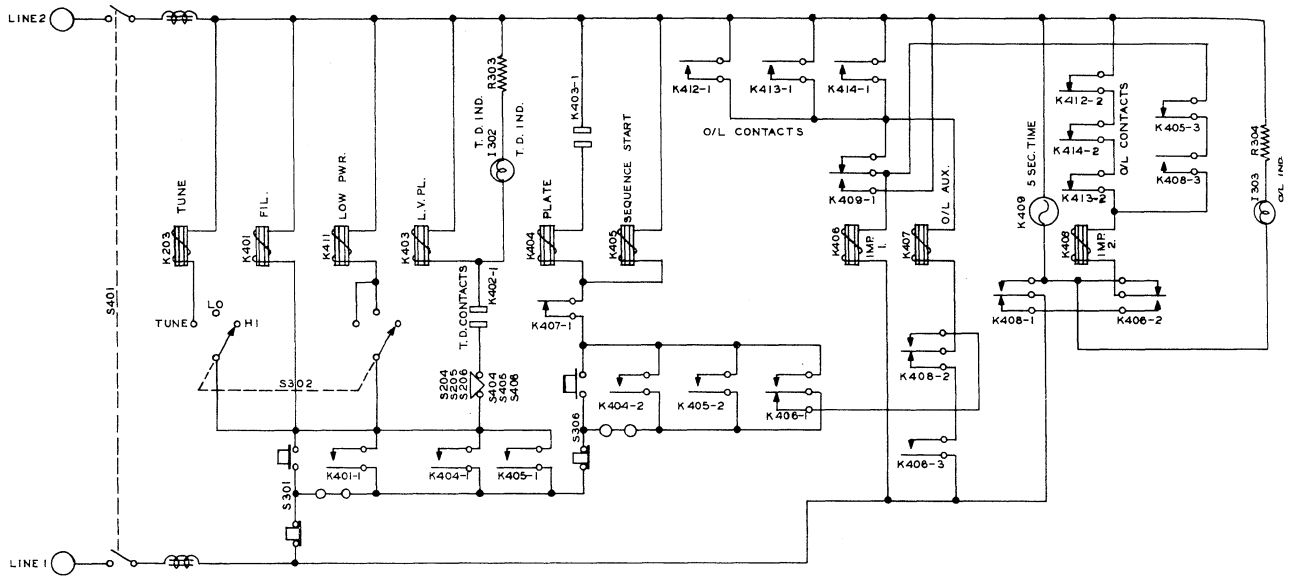


Figure 3-2 Simplified Power Control Circuit

(d) The primary of the crystal heat transformer T204 is connected directly to the power input and is energized at all times. Provisions have also been made for operating T204 from a 115 volt source. (Refer to paragraph 2.1.3.)

3.1.2. Relay Control Circuits. - The simplified control schematic, figure 3-2, shows the power control relays and their contacts.

(a) Normal Starting Sequence.

(1) All circuit breakers are normally closed.

(2) Pull the FILAMENT start-stop control.

(3) The filament relay K401 is energized and held through its own contacts K401-1 and the filament stop switch, S301.

(4) With the contacts of relay K401 closed, the filaments of all tubes, the blower motor, filament pilot lamp and the time delay relay K402 are energized.

(5) After approximately 30 seconds the contacts of relay K402 will close. The low voltage plate relay K403 will then be energized through relay contacts K402-1, the door switches S204, S205, S206, S404, S405, S406, relay contact K401-1 and the filament stop switch.

(6) The low voltage plate transformer and the field coil of the 807's tuning motor are now energized through the power contacts of relay K403.

(7) Pull the PLATE start-stop control.

(8) The high voltage plate relay K404 and the sequence start relay K405 are energized and held through their own contacts and contacts K403-1, K407-1, the plate stop switch, and the filament stop switch.

(9) The line voltage regulator, (if used) the high voltage plate transformer T209, the plate pilot lamp, I304, and the field coils of tuning motors B201, B202, B203, now become energized through the closed contacts of relay K404.

This completes the sequence of operations that takes place when the transmitter is started by operation of both the filament and the plate start controls. The complete sequence of operation can also be accomplished automatically, by merely closing (pulling out) the PLATE start switch.

(b) Automatic Starting Sequence. - When plate start-stop control is operated.

(1) Sequence relay K405 is energized and held through its own contacts, the normally closed contacts of relay K407, the plate stop switch, and the filament stop switch.

(2) The filament relay K401 now becomes energized through the contacts of relay K405 and the filament stop switch and held operated by its own contacts.

(3) Relay K402 becomes energized through the contacts of K401.

(4) In approximately 30 seconds the contacts of relay K402 close, energizing K403.

(5) K403 contacts close, energizing K404 thru the contacts K403-1, K407-1, K405-2, the plate stop switch and the filament stop switch. This completes the sequence of operation when the transmitter is placed in service from a cold start by pulling the plate start switch.

Relays K203 and K411 are energized by operating the POWER switch S302. With the switch in the LOW position the low power relay K411 is energized. The normally closed contacts of relay K411 open and remove the short across the resistance in series with the high voltage plate lead of the final amplifier tubes. When switch S302 is in the TUNE position the tune relay, K203 along with K411, is energized. The normally closed

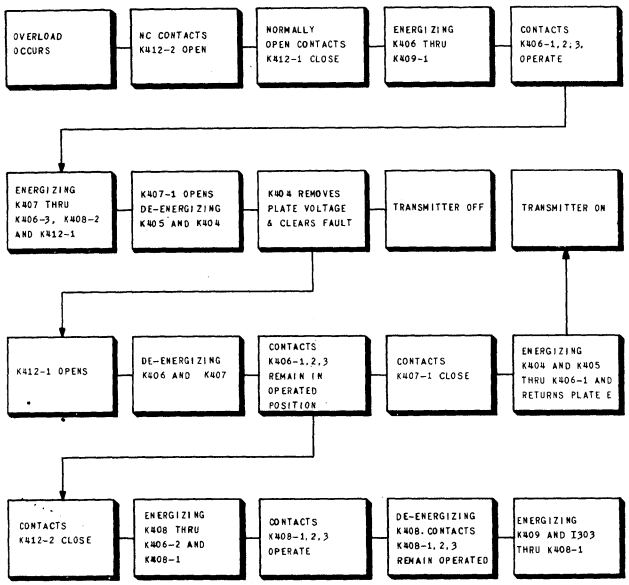


Figure 3-3 Control Circuit Operation After First Overload Occurs

contact of relay K203 then opens and removes the screen voltage of the intermediate amplifier tube, 4-125A, and at the same time the normally open contact closes and grounds the screen of this tube.

3.1.3. Overload or RF Failure. - The control circuit is arranged with a recycling circuit which allows one overload every five seconds without removing the transmitter from the air for more than a fraction of a second. However, should two overloads occur within five seconds, the transmitter will remain off the air.

In the event that only one of the DC overload relays (K412, K413, K414) operates, the sequence of operation shown in block diagram, figure 3-3 takes place.

NOTE

THE NORMALLY CLOSED CONTACTS OF THE OVERLOAD RELAYS MUST OPEN BEFORE THE NORMALLY OPEN CONTACTS CLOSE.

Assume that an overload has occurred in the power amplifier stage and the cathode current of the power amplifier tubes has exceeded a safe value.

If removal of the plate voltage clears the vault and a second overload does not occur within five seconds of the first overload the time elapses and the circuit is returned to normal as shown in the block diagram, figure 3-4 given below.

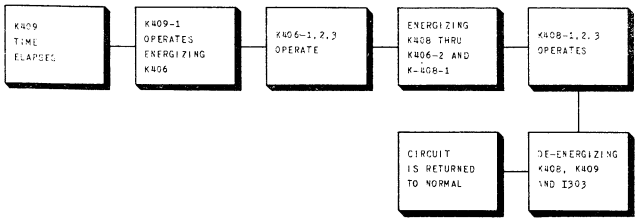


Figure 3-4 Control Circuit Operation During Time Elapse

If a second overload occurs within five seconds after the first overload has been cleared the transmitter remains off until the plate start control is pulled, Refer to the block diagram, figure 3-5.

If at certain times it is desirable to shut down the transmitter during the time elapse after the first overload, merely press the plate or filament start-stop control. The transmitter will then go off the air and the circuit will return to normal. Refer to block diagram figure 3-6.

3.1.4. Filament Circuits. - Filament power for all tubes in the transmitter is supplied by stepdown transformers. All filament transformers are energized by power from two constant voltage transformers to provide the best possible filament voltage regulation. However, all filament transformers are provided with taps on the primary windings to facilitate raising or lowering the

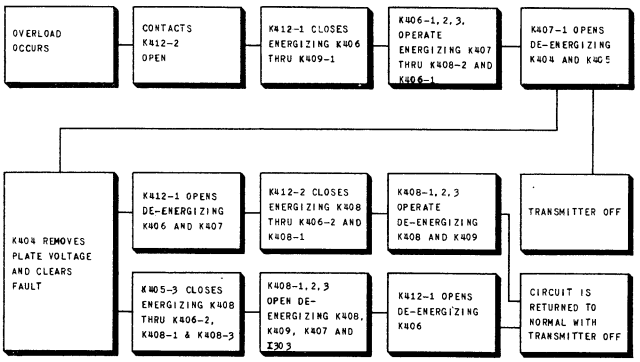


Figure 3-5 Control Circuit Operation After Second Overload Occurs

secondary voltage. Filament Transformer T203 has two secondary windings. One winding furnishes voltage for application to the filaments of the 6F6 oscillators, the 807 buffer and the 807 buffer amplifier tubes. The other winding of T203 supplies voltage to the filament of the 4-125A intermediate amplifier. Filament

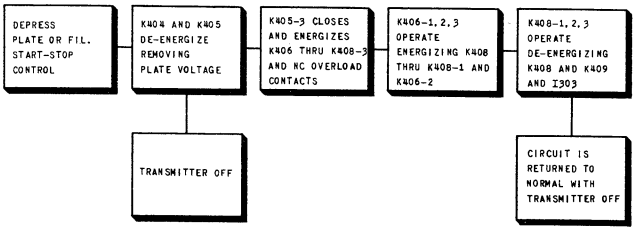


Figure 3-6 Control Circuit Operation On Shutdown During Time Elapse

voltage to the two 833A Power amplifier tubes is supplied by two separate transformers T201 and T202. The two 6N7 audio amplifier tubes and the two 845 audio driver tubes obtain their filament voltage from the two secondary windings of transformer T405. Two separate transformers, T401 and T402, furnish voltage for application to the filaments of the two modulator tubes. Transformers, T205 and T206, furnish the filament voltage for the four type 866A's low voltage rectifier tubes. One transformer, T208, supplies the voltage for application to the filaments of the three type 8008 high voltage rectifier tubes.

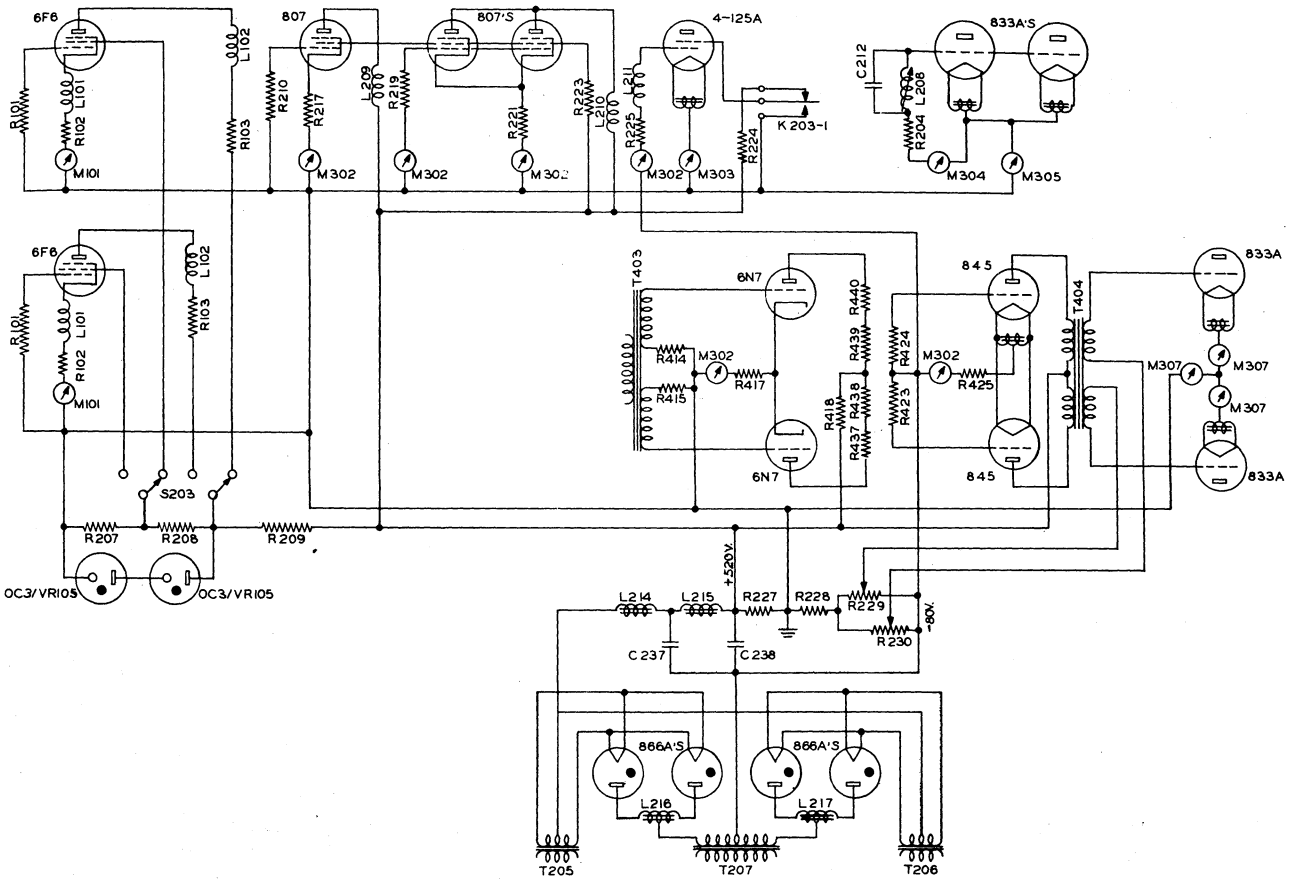


Figure 3-7 Low Voltage and Bias Circuits Simplified

3.1.5. Low Voltage and Bias Supply. (Refer to figure 3-7). Four type 866/866A half wave mercury vapor rectifier tubes are connected in a full wave rectifier system. Power is applied to the plates of the low voltage rectifier by the operation of contactor K403. The plate current flow of the parallel connected 866/866A's is divided by two center tapped chokes, L216 and L217. This arrangement insures more uniform firing of the mercury vapor rectifiers. Should either tube of the parallel connection, "fire" first, the current flow thru the winding to the conducting tube induces square wave impulses in the remaining half of the winding, of sufficient magnitude, to cause the other tube to fire. The dc resistance of the two halves of the chokes winding is in the order of 30 ohms. (15 ohms each side of center tap). This resistance alone would act as a current divider, however, the reactance of these windings to variations of current amplitude, tends to further increase the accuracy of current distribution of the two tubes. The output of the rectifiers is filtered by a two section choke input filter. The negative side is above ground potential. A bleeder consisting of R227, R228, R229 and R230 is connected across the output of the supply. The supply furnishes voltage for the application to the plates of the audio amplifier and the audio driver tubes, and to the plates and screens of the oscillator, buffer and buffer amplifier tubes. Screen voltage and bias for the intermediate

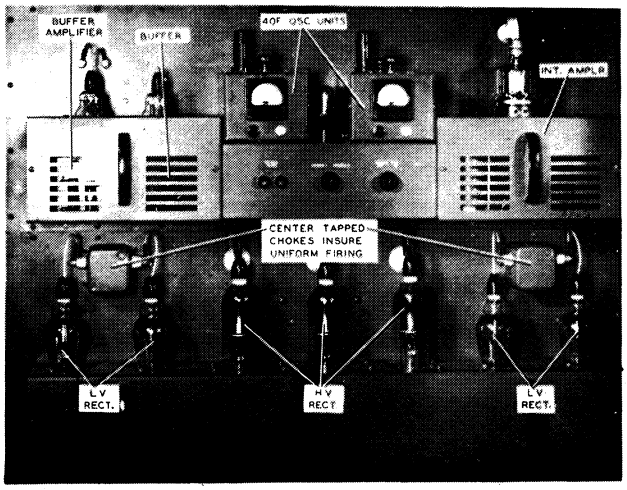


Figure 3-8 High Voltage and Rectifier Section

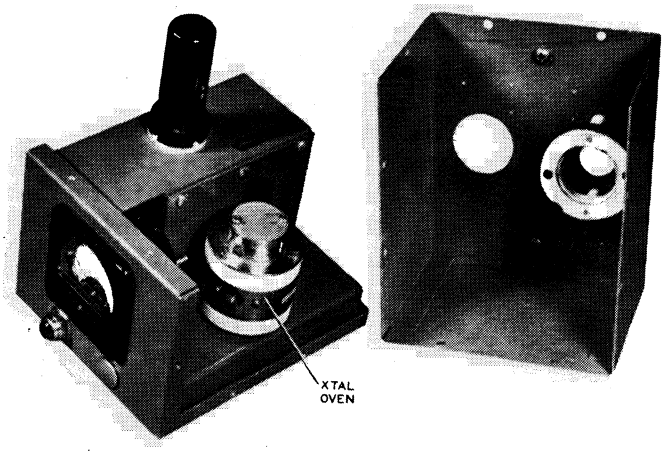
amplifier and bias for the modulator tubes is also furnished by this supply. Two rheostats R229 & R230 vary the amount of voltage applied to the grids of the modulators.

3.1.6. High Voltage Supply. - Three type 8008 half wave mercury vapor rectifiers are connected in a three phase, broken star, half wave rectifier system. The high voltage supply furnishes voltage for the application to the plates of the modulator, intermediate amplifier and the final amplifier tubes. The output is filtered by a single section choke input filter. The filter choke is located in the negative lead. Five filter condensers are across the output of the supply. The filter condensers are individually fused with "grasshopper" type fuses so arranged that the spring gives considerable arc-breaking distance plus an indication as to which fuse has blown. Should a fuse go out due to a charging surge or discharging surge the spring falls back across the capacitor terminals and immediately discharges the capacitor. Blown fuses of this type are easily located. This system offers additional protection to the operator by removing any dangerous potential that may exist across the capacitor. A bleeder consisting of R231, R232, R233, R234 is connected across the output of the supply. Four parallel connected resistors in series with the power amplifier plate lead drop the voltage when the transmitter is operated at half power or when operated in the tune position. The normally closed contacts of the relay, K411 short out the dropping resistors when the power level switch is in the high position. No reduction is made in the voltage that is applied to the modulator tubes for lower power operation.

Figure 3-9 High Voltage Filter Capacitors

3.2. RF CIRCUITS.

3.2.1. Oscillator. - The crystal oscillator employed is a modification of the Colpitts type oscillator circuit. This circuit, utilizing a type 6F6 pentode tube, has high inherent frequency stabil-



A Nameplate	G Thermometer Guide
B Air Cap Regulator	H Anvil
C Locking Ring	I Heater Element
D Top Plate	J Isolantite Base
E Crystal	K Thermostat Cover
F Isolantite Ring	L Angle Thermostat

Figure 3-10 Type 297 Crystal Oven

ity against variations in d-c supply voltage or variation in tube characteristics. Two oscillator units are furnished with the 20T transmitter. Either unit may be selected using the oscillator selector switch, S203. The removal of one oscillator does not affect the operation of the transmitter. The oscillators are supplied with selected low temperature coefficient "A" cut quartz plate crystals with a temperature coefficient of less than three parts per million per degree centigrade. Each crystal is mounted in a Collins type 297 crystal oven. The crystals are maintained at 50 degrees centigrade (60°C on special order) by means of a mercury thermostat having a 0.2 degree sensitivity. A small variable capacitor, C101 is connected across the crystal so that the frequency of operation may be varied in a range ±10 to 20 cps. If it is found necessary, the frequency may be varied over a range of 200 to 300 cps by adjusting the air gap between the connecting plate and the quartz crystal. This operation is explained in paragraph 2.2.5 of this instruction book. Plate and screen voltage supply for the oscillator is made stable by a voltage regulating circuit consisting of two OC3/VR105 tubes and a voltage divider consisting of R207, R208, and R209. The cathode current of the oscillator is metered by M101 to indicate functioning of the oscillator.

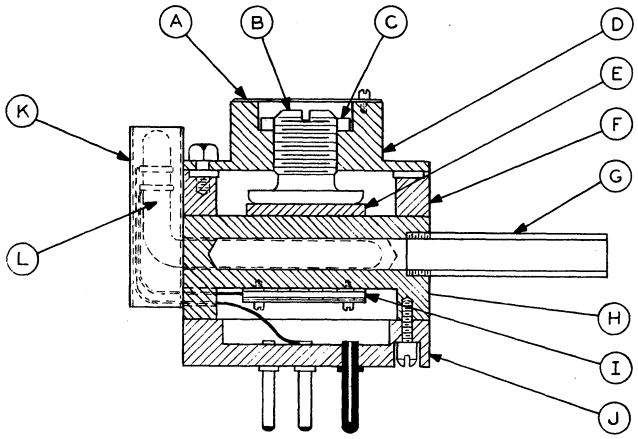


Figure 3-11 Placement of Crystal Oven

3.2.2. First Buffer. - The output coupling of the oscillator to the grid of the first buffer is controlled by the variable capacitor C220. The Buffer stage employs an 807 beam power amplifier operating class A. This tube serves to isolate the oscillator from the reaction of changes in circuit tuning or operating conditions in the following stages. The cathode current of this stage is metered by the test meter M302 when the test meter switch is in the 807 CATHODE position.

3.2.3. Buffer Amplifier. - The buffer amplifier stage utilizes two 807 tubes in a parallel connected circuit operating class "C". The use of two tubes in this stage assures more than ample drive to the following stage. In case either one of the tubes should become inoperative, the remaining tube would be sufficient

for satisfactory operation. The screens of this buffer amplifier stage and of the preceding class A amplifier are tied together to create a slight automatic excitation control; thereby maintaining fairly uniform excitation throughout line voltage variations. The plate tank circuit of this stage is also utilized as the grid circuit of the following stage. The tank circuit capacitor is motor driven and controlled from the front panel. The tank inductor L213 is provided with a sliding connector to vary the degree of loading of the plate circuit and the coupling to the grid of the intermediate amplifier stage. An adjustable tap is also arranged on inductors L213 for the purpose of operating a frequency monitor. The cathode current of the 807 tubes is indicated on the test meter when the TEST SWITCH is in the 807's CATHODE position. The grid current is indicated on the same meter with the TEST SWITCH in the 807's GRID position.

3.2.4. Intermediate Amplifier. - The intermediate amplifier employs a type 4-125A power tetrode tube. The amount of drive to this stage is determined by the position of the tap on inductor L213 to which the grid is capacitively coupled. A fixed bias of approximately 80 volts is applied to the grid by the low voltage supply in addition to the rectified grid voltage obtained when the tube is being driven. When the POWER change switch S302 is in the TUNE position, the screen of the 4-125A is grounded and acts as a suppressor to limit the amount of plate current flow when the stage is being tuned. The plate tank circuit consists of a variable inductor L208 with adjustable taps and a fixed capacitor C212. The inductor L208 is motor driven and is controlled from the front panel. The coil of an overload relay, K414, is connected between the center tap of the 4-125A filament winding of transformer, T203, and ground. If the cathode current of the 4-125A tube exceeds the safe value, relay K414, will be operated, which results in the removal of the plate voltage. The grid current is metered by operating switch S303 to the 4-125A GRID position. With the switch in this position the test meter M302 is connected in series with the lead from the bias supply to the grid of the 4-125A tube and shunts the meter across resistor R226. The cathode current is metered at all times with meter M303 inserted in series with the coil of the overload relay K414.

3.2.5. Power Amplifier. - The power amplifier employs two type 833A triode tubes connected in a parallel circuit. The grids of these tubes are connected to an adjustable tap on the plate tank inductor of the intermediate amplifier. Bias for this stage is obtained solely from the rectified grid voltage when excitation is applied. The plate is shunt fed thru a r-f choke (L205). The plate tank and output network is a combination of "pi" and "T" matching sections. This combination reduces harmonics to a negligible value and can be matched to quite a wide range of transmission line impedances by varying the constants of the "T" section. The plate tank inductor L201 and the loading network capacitor C206 are motor driven and controlled from the front panel. The arms of the "T" section are variable inductors. A pickup coil to provide means of coupling the modulation monitor to the output of the transmitter is connected from the output end of the "T" section to ground. The RF LINE CURRENT is connected in series with the transmission line and may be read from the front of the transmitter when the cabinet door is closed.

Coil neutralization is employed in this stage. The combination of inductor L206 and capacitor C210 resonates

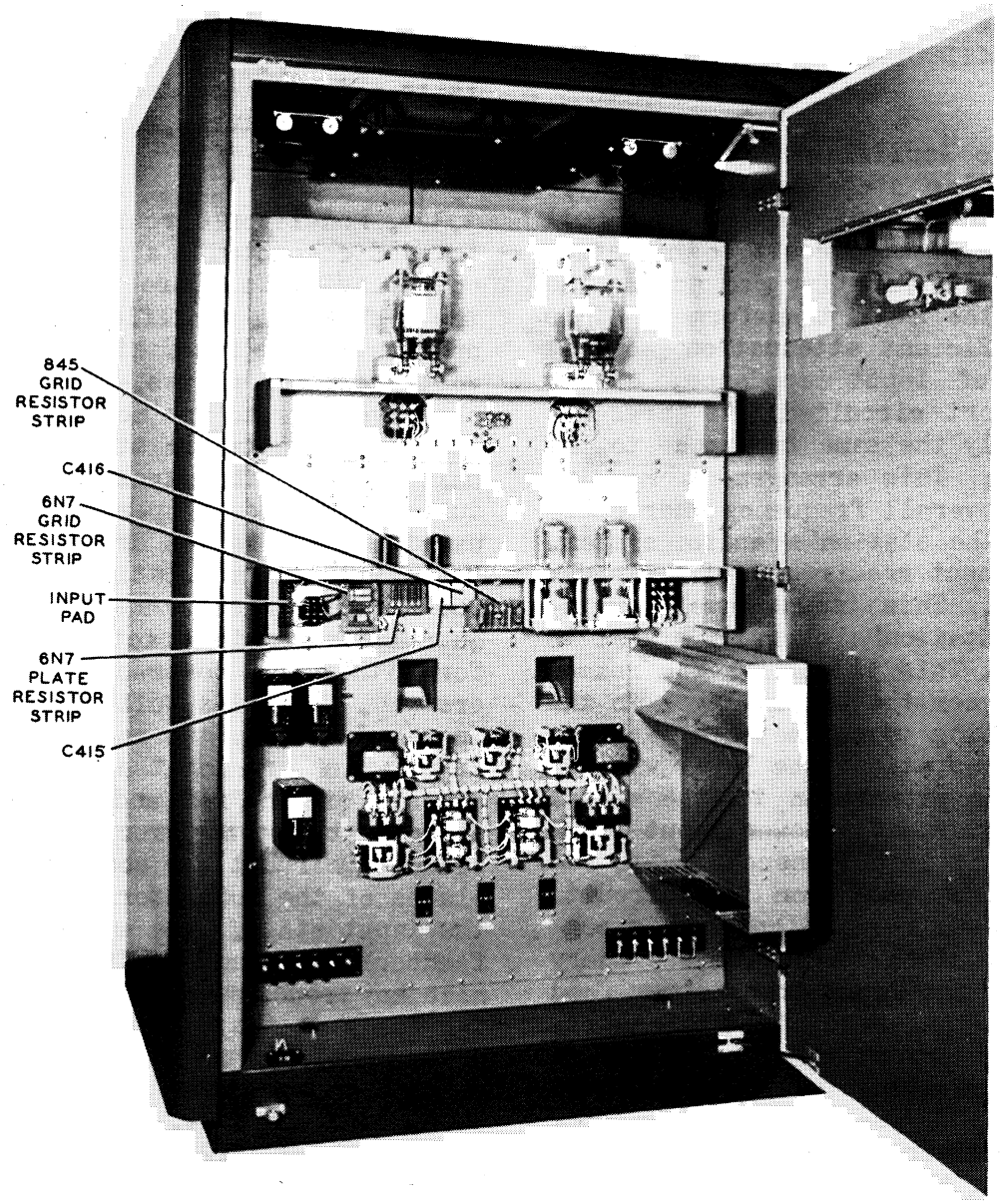


Figure 3-12 Audio and Control Bay - Front Inside With Dust Covers Removed

with the grid to plate capacity of the tube at the operating frequency. When the circuit is properly adjusted the impedance from grid to plate is very high and the amplifier is neutralized for the frequency of operation.

The grid current of the two Power Amplifier tubes is metered at all times by M304 which is inserted in series with the grids and the center taps of the filament windings of these tubes. The plate current of both tubes is metered at all times by M305. The coil of an overload relay is connected between the center taps of the two filament windings of these tubes and ground. This relay operates when the cathode current exceeds a safe value and prevents damage to the tubes. The filaments of the RF Power Amplifier tubes are connected in a quadradture arrangement to excite the filaments 120° out of phase. This results in material reduction of hum.

3.3. AUDIO CIRCUIT.

3.3.1. Audio Amplifier Circuit. - The audio amplifier stage employs two type 6N7 triode tubes connected in a push pull circuit. The input circuit to this stage consists of a terminating pad across the primary of the input transformer. This pad has sufficient attenuation so that regardless of input impedance, either open or short circuited, it presents approximately the same impedance to the transmitter. This arrangement may improve the overall frequency characteristics of the station's audio system. The audio input required is of the order of +18 dbm. This input level may improve the station's overall signal to noise ratio. This is true for the reason that the higher the signal level in the interconnecting wires between various units at the station, the lower will be the noise in proportion to the signal level. However, if a lower input level is required it is only necessary to remove the input pad from the circuit. The input level required under this condition is about +12 dbm. The secondary windings of the input transformer feed directly into the grids of the 6N7 tubes. The cathode current of this stage is metered by rotating the TEST SWITCH to the 6N7 cathode position. This places the test meter across resistor R416 which is located in the cathode circuit. The output of the audio amplifier is resistance coupled to the grids of the tubes in the audio driver stage.

3.3.2. Audio Driver Circuit. - The audio driver stage utilizes two type 845 triode tubes connected in a push pull circuit operating Class A. The cathode current of both tubes is metered by rotating the TEST SWITCH to the 845 CATH. position. The tubes are self biased by cathode resistor R425. The output of this stage is transformer coupled to the resistor R425. The output of this stage is transformer coupled to the grids of the modulator tubes.

3.3.4. Modulator Circuit. - Two type 833A triodes connected in a push pull circuit operating Class B are used to modulate the r-f final amplifier. These tubes operate with a fixed bias and with 2500 volts on their plates. No reduction in plate voltage to the modulator tubes is made when the transmitter is operated at half power. The excess audio power, during half power operation, is dissipated in the series dropping resistors following the modulation transformer. Due to this fact, the audio input requirements remain practically the same for either 1/2 power or full power operation. The bias voltage to the tubes is regulated by two rheostats, R229 & R230, which are located on the vertical chassis of the r-f and rectifier bay, directly below the rectifier tubes, A feedback circuit is connected from the plates of the modulator to the grids of the input stage. The amount of inverse feedback employed is sufficient to minimize any trouble encountered due to varying loads on the modulator. The output of the modulator is coupled to the plate circuit of the power amplifier tubes by T406, L401 and C424. A low pass filter consisting of L220 and C202, has been incorporated between the modulator and the final amplifier to attentuate the high frequency response at a fairly rapid rate above 10,000 cycles. This low pass filter is very effective in eliminating any "sing", transients, etc., that may appear on the carrier due to some part failure or other trouble in the audio amplifier. The cathode currents of the modulator tubes are metered separately by rotating the TUNE-METER SWITCH to the MOD. 1 and MOD. 2 positions. DC overload protection is furnished by an overload relay inserted in the cathode circuit of the two tubes.

SECTION 4

OPERATION

4.1. GENERAL.

The steps outlined in this section may be used as a guide to routine operations of the equipment, subsequent to completion of the initial adjustments. It is suggested that the operator refer to the adjustment section of this instruction book for a more detailed explanation in regard to adjustment of the transmitter circuits. Control knobs and meter locations are shown in figure 2-7. All tuning controls are motor driven and function through a raise and lower knob on the front panel of the R-F and Rectifier cabinet.

4.2. ROUTINE OPERATION.

4.2.1. Starting Equipment. - The transmitter may be placed in full operation from a cold start by pulling the PLATE start-stop control.

After a period of approximately 30 seconds the plate power is automatically applied and the transmitter is in full operation. All meters should be checked to determine if each circuit is operating properly. The following table list the approximate values of meter readings for typical operating conditions.

TYPICAL METER READINGS

METER AND CIRCUIT		OUTPUT POWER LEVEL	
		1000 Watts	500 Watts
Oscillator,	Cathode Current	10 - 27 ma	10 - 27 ma
Class A Buffer,	807 CATH.	28 ma	28 ma
Class C Buffer,	807's GRID	5 ma	5 ma
Class C Buffer,	807's CATH.	75 ma dc	75 ma
Intermediate Amp.,	4-125A GRID	10 ma	10 ma
Intermediate Amp.,	INT. AMP. CATHODE	140 ma	140 ma
Final Amplifier,	FINAL AMP. GRID	190 ma	200 ma
Final Amplifier,	FINAL AMP. PLATE CURRENT	615 ma	430 ma
Final Amplifier,	FINAL AMP. PLATE VOLTAGE	2440 volts	1790 volts
	R.F. LINE CURRENT	3.83 amp. r-f	2.63 amp r-f
Audio Amp.,	6N7 CATH. Current	10 ma	10 ma
Audio Driver	845 CATH. Current	107 ma	107 ma
Modulator,	MOD. 1 Current	30 ma no mod. 300 ma 100% mod.	30 ma no mod. 210 ma 100%mod.
Modulator,	MOD. 2 Current	30 ma no mod. 300 ma 100% mod.	30 ma no mod. 210 ma 100%mod.
Modulator,	Cathode Current Both Tubes	60 ma no mod. 600 ma 100% mod.	60 ma no mod. 420 ma 100%mod.

4.2.2. Power Level. - Operation at either full power or 0.5 power may be selected by operating the POWER knob.

4.2.3. Stopping Equipment. - The transmitter may be completely shut off by pressing the FILAMENT start-stop control.

SECTION 5

PREVENTIVE MAINTENANCE

This radio transmitting equipment has been constructed of materials considered to be the best obtainable for the purpose, and has been carefully inspected and adjusted at the factory to reduce maintenance to a minimum. However, to insure peak performance and prevent the failure or the impairment of the operation of the equipment, a definite schedule of routine periodic checks and maintenance procedures should be adhered to.

5.1. CLEANING.

5.1.1. Transmitter General. - The greatest enemy to uninterrupted service in equipment of this type is corrosion and dirt. Corrosion is accelerated by the presence of dust and moisture on the component parts in 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 clean dry jet of air. Another alternative would be to use a vacuum cleaner. Although the cabinets are equipped with dust filters which will remove most of the dust particles, there is always a slight accumulation of dust in the vicinity of circuits at a high potential. Remove the dust by the above method as often as a perceptible quantity accumulates at any place in the equipment. It is very important that rotating equipment such as variable capacitors, tap switches, etc., be kept free from dust to prevent undue wear. Corrosion resulting from a 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, and cable plug connectors are most affected by corrosion. When the equipment is operated in localities subject to such corrosive atmosphere, inspection of wiping contacts, cable plugs, relays, etc., should be made more frequently in order to keep the equipment in good condition.

A cleaning schedule should be set up to include only a limited amount of cleaning and dusting to be done at one time. In this way it will require only a few minutes each night after shutdown and a more thorough job will be accomplished. Assign a different section of the transmitter to be covered each night. Arrange the schedule so that a complete coverage of the transmitter is obtained in a week's time.

5.1.2. Air Filter. - The spun glass filter elements at the rear of the transmitter will give more satisfactory life if the elements are cleaned about once every two weeks. A small vacuum cleaner is a satisfactory means of removing surface dirt. The elements should be replaced whenever the spun glass appears to be appreciably clogged by dust and grease.

5.2. ROUTINE CHECKS.

5.2.1. General Inspection.

(a) Check all connections at least once a month. Tighten all loose nuts, bolts and screws.

(b) Inspect interlock switches in the front and rear doors for proper operation.

(c) Examine all mechanical parts of motor driven assemblies for excessive wear.

(d) Check all contacts of cable receptacles and plugs to assure a clean, firm mechanical connection between one another.

(e) Check all manually operated switches for excessive wear.

(f) Check all relays for proper operation and inspect relay contacts to make certain they are clean and free from pits.

IMPORTANT - The normally closed contacts of the overload relays must open before the normally open contacts close.

(g) Examine electrical system for excessive heating of transformers, resistors, chokes, etc.

5.2.2. Tube Check.

(a) A check on the emission of all vacuum tubes should be made at least every 1000 hours of service.

(b) Keep a record of the length of time the tubes are in use.

(c) Replace tubes that have been in service an excessive length of time.

(d) Visually inspect the elements inside of the tubes. Elements may have become warped, increasing the possibility of short circuiting.

(e) Maintain the filament voltage within 5% of the recommended values for the type of tube used. Too high or too low a filament voltage affects the tube operation and reduces tube life.

(f) Examine the prongs on all tubes to make certain that they are free from corrosion. When replacing tubes, make sure that they are seated correctly and fully in the socket and that they make a good electrical contact. If it has a plate or grid cap lead, be sure this is properly in place and in good electrical and mechanical condition.

5.2.3. Voltage and Current Checks. - During actual operation, meter indications should be under frequent observation to verify the proper operating currents and voltages. A table showing the approximate meter indications under typical operating conditions is shown in Section 4. Some variations in the current and voltage may occur but most satisfactory results are obtained from operation at rated values.

5.2.4. Performance Checks. - Electrical performance tests should be made periodically and should include measuring the distortion at a number of modulation levels and noise measurements.

5.3. LUBRICATION.

5.3.1. Ventilating Blowers. - The bearings of the ventilating blower motor should be lubricated with a light grade of spindle oil having a viscosity of 190 - 220 Saybolt universal seconds at 100° F such as Cities Service Pacemaker No. 2 or equal. Use a small amount at one time and lubricate every 1000 hours.

5.3.2. Tuning Motors and Assemblies. - Lubricate with the same type of oil as prescribed for the blower motors. Lubricate every 1000 hours using a small amount at one time.

5.4. MAINTENANCE TOOLS.

The proper use and care of maintenance tools and equipment is very important. Tools and maintenance equipment should be handled carefully while being used and kept in good condition at all times. Arrange the maintenance equipment in a well laid out manner on a work bench or cart so that the proper tools are available in case of emergencies. Always use the tool that was intended for the job being performed. When wrong tools are used while working on a unit, unnecessary damage to the equipment may result. Keep a good supply of maintenance equipment on hand at all times. Check supplies of lubricants, cleaning agents, sandpaper, etc., and replenish the supply when necessary.

5.5. RELAY MAINTENANCE.

Included in the schedule of preventive maintenance is relay maintenance. Dependable operation of this equipment requires proper operation of all relays. Although each relay in this equipment has been chosen because of satisfactory performance in similar service, some of these relays have rather critical adjustments and should not be tampered with. In case of failure of the telephone type relays, it is best to replace the entire relay. The only maintenance recommended is the periodic use of a burnishing tool to clean the contact surfaces.

In general, the contact adjustment of the a-c type of power relay is not critical. Contact assemblies and coils can be replaced in case of failure. Never use sandpaper or emery cloth on the contact surfaces. Relays which have excessive hum are not seating properly. Dirt on the pole faces is most likely the cause of this, and can be remedied by washing with carbon tetrachloride.

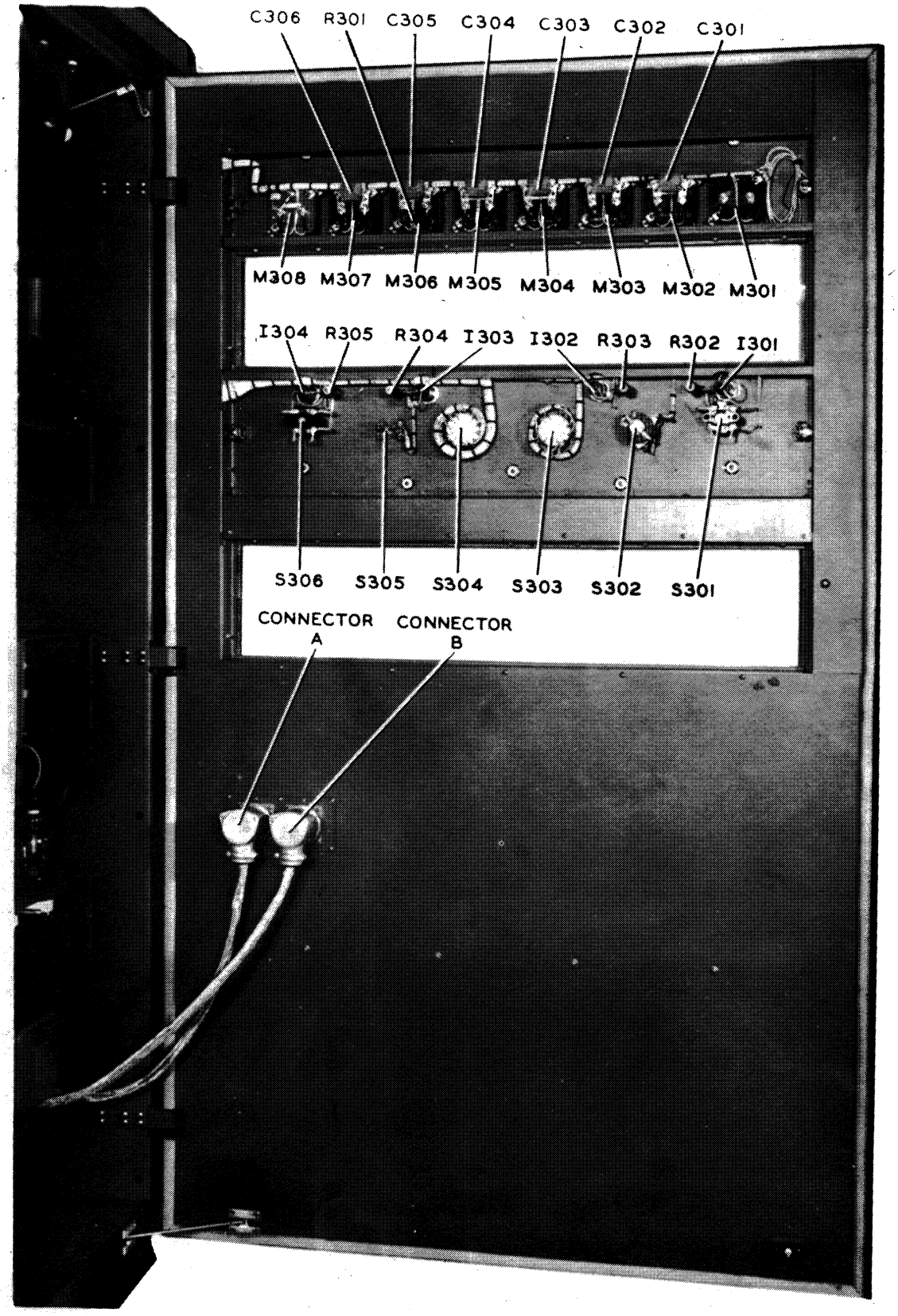


Figure 6-1 Control Door Inside View

SECTION 6

CORRECTIVE MAINTENANCE

If routine maintenance checks and inspection schedules, as outlined in Section 5, are performed regularly, very little trouble is likely to occur with this equipment. However, it is realized that at times certain parts will fail, not because of improper selection of components but rather a defective part which may show up one or two out of every hundred. It is impossible to forsee every case of trouble that may develop, but very little should occur, without being evident by abnormal readings of the meters in the transmitter. An experienced operator should have little difficulty, in locating and correcting the faults A systematic procedure of testing should be followed to quickly isolate the circuit at fault.

6.1. TROUBLE SHOOTING.

6.1.1. Tube Failure. - The most frequent cause of trouble in equipment of this type is tube failure. If a fault occurs in the equipment, isolation of the circuit at fault is helpful in determining the location of the defective tube. Defective tubes causing an overload in power circuits may usually be located by inspection. It will be found that excessive heating or sputtering within vacuum tubes is a good indication of fault in the tube circuit. Low emission tubes may be the cause of erratic or poor performance of the equipment. If there is any doubt concerning the emission of any tube, it should be checked immediately and replaced if defective. A burnt out filament, obviously, would give no light with voltage applied. Tubes with electrical noises cause excessive distortion or hum. This fault may be more difficult to isolate to a particular tube, however, a tube suspected of faulty operation may be checked by replacing with a like tube known to be in good condition.

6.1.2. Location of Trouble. - The transmitter may fail to function either at the time of attempting to start it, or it may fail during operation. In either case, the procedure for making a test is to check the circuits in the order of succession they are made operative in the process of starting the transmitter. Refer to paragraph 3.1.2. for the sequence of operation that takes place during normal starting sequence.

This procedure should aid in isolating the trouble to one or two units. A check of all circuit breakers should be made to ascertain the power circuit affected by the trouble.

Check for blown fuses.

The following tables of operating voltages and current measurements is supplied to assist the operator in trouble shooting. Open and short circuits will usually be accompanied by a change in the voltage applied to one or more of the tubes. A check of the various tube voltages and current measurements against the values shown in the tables will assist in locating the source of trouble.

6.1.3. Cable Trouble. - To provide centralized control and metering on the front door it is necessary to run approximately 60 wires between the vertical chassis and the control door. This is done through two cables fitted with Cannon connectors. The circuits are so arranged that only one cable is necessary to provide the essential transmitter functions such as tuning, metering, etc. The other cable carries all the circuits which are convenient to have but are not absolutely essential to the transmitter operation such as, filament metering, pilot

20T

TYPICAL METER READINGS

Carrier Frequency: 700 kc

Full Power Output: 1100 W

Line Voltage: 230 V

OPERATING CONDITION	OSC.	CLASS A BUFFER	CLASS C BUFFER		INTERMEDIATE AMPLIFIER		FINAL R-F AMP.			LINE CURRENT	SP. AMP. CATHODE	DRIVER CATHODE	MODULATOR		
							GRID	PLATE	PLATE				LEFT	RIGHT	BOTH
	CATHODE ma/dc	CATHODE ma/dc	GRID ma/dc	CATHODE ma/dc	GRID ma/dc	CATHODE ma/dc	ma/dc	ma/dc	ma/dc	amp rf	ma/dc	ma/dc	CATHODE ma/dc	CATHODE ma/dc	CATHODE ma/dc
HV on, Final off															
Power SW. in "tune"pos.	11.5	30	5.1	80	17.1	40	65	0	0	0	10.8	109	80	80	160
Half power, no mod,	11.5	28	5.1	75	10.8	140	200	430	1790	2.63	10.4	107	30	30	60
1000 cps															
100% mod.	11.5	28	5.1	74	10.4	138	195	420	1780	3.19	10.4	108	210	210	420
Full power, no mod,	11.5	28	5.1	74	10.8	140	189	615	2440	3.83	10.4	107	30	30	60
1000 cps															
100% mod.	11.5	28	5.1	73	10.0	135	185	605	2390	4.50	10.3	107	300	300	600

Modulator Cathode Current in ma/dc at 95% Modulation

Frequency cps		20	30	50	70	100	200	400	1000	2000	3000	5000	7500	10,000
(Power)	(Tube)													
Half	Left	235	250	220	210	210	205	205	210	215	230	265	295	320
Half	Right	220	240	215	210	210	205	205	210	215	230	260	290	310
Full	Left	245	285	305	300	290	290	290	290	295	305	340	355	390
Full	Right	230	275	300	295	290	290	290	290	295	305	335	350	375

lights, etc. Therefore, should one cable give trouble it is only necessary to put the good cable in the key position and repair the other cable while the equipment is in operation.

6.1.4. Servicing the Equipment. - The major portion of components are constructed on the two vertical chassis within the cabinets. This adds considerable accessibility to all components, as access to all components is readily attained from either front or the rear of the transmitter. Each tube SPAR has been arranged with a cover that is easily removed and all the parts thereunder are readily accessible. The air baffles in the rear cabinet can be removed promptly if deemed necessary to gain access to components that need servicing. The wiring on the rear of the vertical chassis is exposed by removing the channel covers. The meter and control door wiring is accessible upon removal of two covers. One-man replacement of all components has been designed into this equipment wherever practical.

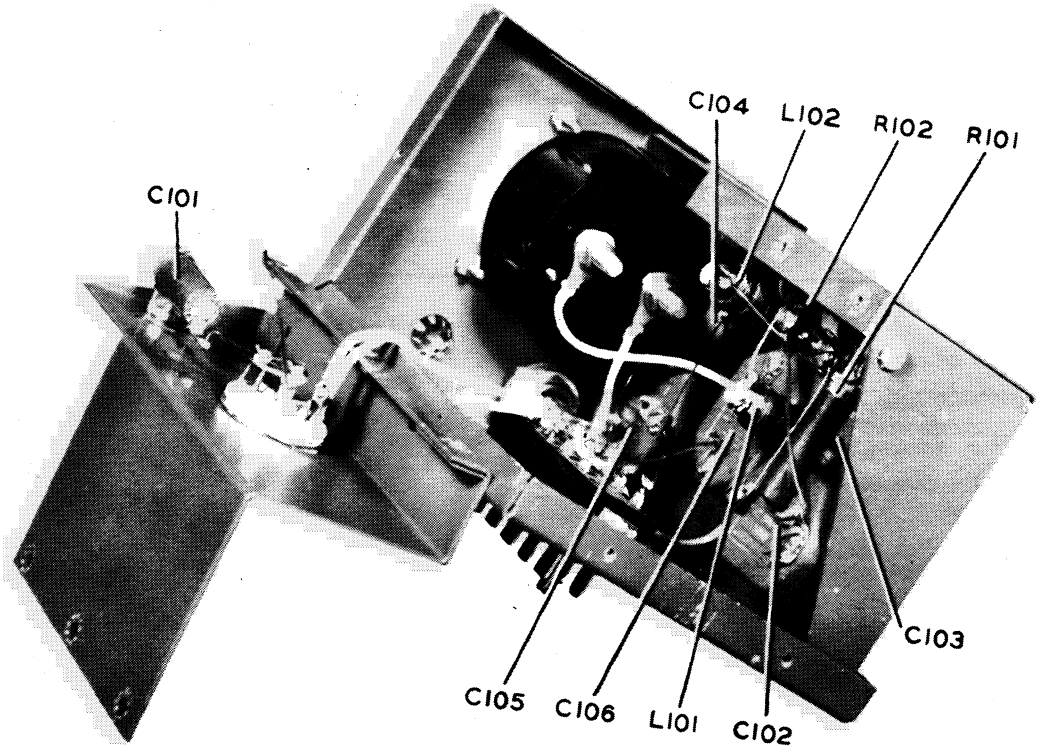


Figure 6-2 40F Frequency Control Unit
Parts Arrangement

SECTION 7
20T PARTS LIST

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
B201	Final Amp plate tuning	MOTOR: 230 v, 60 cps, 4 RPM; continuous duty	230 0012 00
B202	Final amp load tuning	MOTOR: 230 v, 60 cps, 4 RPM; continuous duty	230 0012 00
B203	Int amp plate tuning	MOTOR: 230 v, 60 cps, 4 RPM; continuous duty	230 0012 00
B204	Buffer plate tuning	MOTOR: 230 v, 60 cps 4 RPM; continuous duty	230 0012 00
B205	RF bay cooling	MOTOR: 230 v 50/60 cps	230 0013 00
B401	Mod. bay cooling	MOTOR: 230 v 50/60 cps	230 0013 00
C101	Crystal trimmer	CAPACITOR: 1-12 mmf	922 3100 00
C102	Oscillator feed-back	CAPACITOR: 51 mmf ±2%; 2500 WV	937 0018 00
C103	Oscillator cathode bypass	CAPACITOR: 270 mmf ±2%; 2500 WV	937 0064 00
C104	Oscillator screen grid bypass	CAPACITOR: 10,000 mmf ±10%; 1200 WV	937 0170 00
C105	Oscillator plate bypass	CAPACITOR: 10,000 mmf ±10%; 1200 WV	937 0170 00
C106	Oscillator plate blocking	CAPACITOR: 1000 mmf ±10%; 2500 WV	937 0104 00
C201	833A (RF) plate blocking	CAPACITOR: 2000 mmf ±5%; 10,000 WV	939 1040 00
C202	833A (RF) plate bypass	CAPACITOR: 100 mmf ±5%; 10,000 WV	939 1009 00
*C203	Plate tank capacitor 540-700 kc	CAPACITOR: 820 mmf ±5%; 30,000 WV	939 3023 00
	700-900 kc	CAPACITOR: 820 mmf ±5%; 30,000 WV	939 3023 00
	900-1200 kc	CAPACITOR: 680 mmf ±5%; 30,000 WV	939 3021 00
	1200-1600 kc	CAPACITOR: 510 mmf ±5%; 30,000 WV	939 3018 00

* Choose RF tank components for frequency range applicable to individual transmitter.

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
*C204	Output loading capacitor 540-700 kc	CAPACITOR: 1500 mmf ±5%; 10,000 WV	939 1037 00
	700-900 kc	CAPACITOR: 1500 mmf ±5%; 10,000 WV	939 1037 00
	900-1200 kc	CAPACITOR: 1500 mmf ±5%; 10,000 WV	939 1037 00
	1200-1600 kc	CAPACITOR: 1000 mmf ±5%; 10,000 WV	939 1033 00
C205	Output loading capacitor	CAPACITOR: 200 mmf ±5%; 6000 WV	939 0016 00
C206	833A (RF) plate loading	CAPACITOR: 36-501 mmf	920 9100 00
*C207	Output T network 540-700 kc	CAPACITOR: 620 mmf ±5%; 20,000 WV	939 2028 00
	700-900 kc	CAPACITOR: 510 mmf ±5%; 20,000 WV	939 2026 00
	900-1200 kc	CAPACITOR: 360 mmf ±5%; 20,000 WV	939 2022 00
	1200-1600 kc	CAPACITOR: 270 mmf ±5%; 20,000 WV	939 2019 00
*C208	Output T network 540-700 kc	CAPACITOR: 620 mmf ±5%; 20,000 WV	939 2028 00
	700-900 kc	CAPACITOR: 510 mmf ±5%; 20,000 WV	939 2026 00
	900-1200 kc	CAPACITOR: 360 mmf ±5%; 20,000 WV	939 2022 00
	1200-1600 kc	CAPACITOR: 270 mmf ±5%; 20,000 WV	939 2019 00
C209	833A (RF) plate blocking (neutralizing circuit)	CAPACITOR: 240 mmf ±5%; 10,000 WV	939 1018 00
C210	833A (RF) Neutralizing circuit tuning	CAPACITOR:	503 1034 002 503 1033 002
C211	833A grid bypass	CAPACITOR: 51,000 mmf ±5%; 1500 WV	938 2148 00
*C212	Int. amp plate tank capacitor 540-700 kc	CAPACITOR: 820 mmf ±5%; 20,000 WV	939 2031 00

* Choose RF tank components for frequency range applicable to individual transmitter.

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
	700-900 kc	CAPACITOR: 620 mmf ±5%; 20,000 WV	939 2028 00
	900-1200 kc	CAPACITOR: 510 mmf ±5%; 20,000 WV	939 2026 00
	1200-1600 kc	CAPACITOR: 390 mmf ±5%; 20,000 WV	939 2023 00
C213	4-125A plate blocking	CAPACITOR: 2000 mmf ±5%; 5000 WV	938 2080 00
C214, C215, C216, C217	833A (RF) filament bypass	CAPACITOR: 10,000 mmf ±10%; 1200 WV	937 0170 00
C218	833A (RF) overload relay bypass	CAPACITOR: 10,000 mmf ±10%; 1200 WV	937 0170 00
C219	833A (RF) grid filter capacitor	CAPACITOR: 10,000 mmf ±10%; 1200 WV	937 0170 00
C220	6F6-807 RF coupling	CAPACITOR: 5.6-100 mmf	922 0005 00
C221	807 cathode RF bypass	CAPACITOR: 27,000 mmf ±10%; 1200 WV	937 2053 00
C222	807 screen RF bypass capacitor	CAPACITOR: 10,000 mmf ±10%; 1200 WV	937 0170 00
C223	807 coupling capacitor	CAPACITOR: 100 mmf ±10%; 2500 WV	937 0038 00
C224	807 grid metering resistor bypass	CAPACITOR: 10,000 mmf ±10%; 1200 WV	937 0170 00
C225	807 cathode bypass	CAPACITOR: 27,000 mmf ±10%; 1200 WV	937 2053 00
C226	807 screen grid bypass	CAPACITOR: 10,000 mmf ±10%; 1200 WV	937 0170 00
C227	807 plate bypass	CAPACITOR: 10,000 mmf ±10%; 1200 WV	937 0170 00
C228	807 plate blocking	CAPACITOR: 5600 mmf ±10%; 1200 WV	937 0154 00
*C229	4-125A grid tank padding 540-700 kc	CAPACITOR: 2400 mmf ±5%; 3000 WV	938 0084 00

* Choose RF tank components for frequency range applicable to individual transmitter.

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
	700-900 kc	CAPACITOR: 2000 mmf ±5%; 3000 WV	938 0080 00
	900-1200 kc	CAPACITOR: 1500 mmf ±5%; 3000 WV	938 0074 00
	1200-1600 kc	CAPACITOR: 1000 mmf ±5%; 3000 WV	938 0066 00
C230	4-125A grid tank tuning	CAPACITOR: 18-475 mmf	921 1300 00
C231	807 4-125A coupling	CAPACITOR: 10,000 mmf ±10%; 2500 WV	937 2025 00
C232, C233	4-125A filament RF bypass	CAPACITOR: 10,000 mmf ±10%; 1200 WV	937 0170 00
C234	4-125A screen RF bypass	CAPACITOR: 10,000 mmf ±10%; 1200 WV	937 0170 00
C235	4-125A grid bypass	CAPACITOR: 10,000 mmf ±10%; 1200 WV	937 0170 00
C236	4-125A plate RF bypass	CAPACITOR: 2000 mmf ±5%; 5000 WV	938 2080 00
C237, C238	Low voltage supply filter	CAPACITOR: 15 mf ±10%; 1000 WV	930 0050 00
C239, C240	High voltage supply filter	CAPACITOR: 4 mf ±10%; 4000 WV	930 4512 00
C301	Test meter bypass	CAPACITOR: 10,000 mmf ±10%; 600 WV	936 0315 00
C302	Int amp cathode Current meter bypass	CAPACITOR: 10,000 mmf ±10%; 600 WV	936 0315 00
C303	Final amp grid meter bypass	CAPACITOR: 10,000 mmf ±10%; 600 WV	936 0315 00
C304	Final amp plate current meter bypass	CAPACITOR: 10,000 mmf ±10%; 600 WV	936 0315 00
C305	Final amp plate voltage meter bypass	CAPACITOR: 10,000 mmf ±10%; 600 WV	936 0315 00
C306	Mod cathode current meter bypass	CAPACITOR: 10,000 mmf ±10%; 600 WV	936 0315 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
C401, C402, C403, C404, C405, C406, C407, C408, C409, C410	Audio feedback	CAPACITOR: 100 mmf ±5%; 2500 WV	937 0037 00
C411, C412	Feedback insertion	CAPACITOR: 5600 mmf ±5%; 1200 WV	936 1109 00
C413	607 plate decoupling	CAPACITOR: 10 mf ±10%; 1000 WV	930 0038 00
C414	845 plate audio bypass	CAPACITOR: 10 mf ±10%; 1000 WV	930 0038 00
C415, C416	607-845 audio coupling	CAPACITOR: 0.5 mf ±10%; 1000 WV	960 2086 20
C417, C418	845 grid filter	CAPACITOR: 2000 mmf ±5%; 1200 WV	936 0268 00
C419		CAPACITOR: Not used	
C420		CAPACITOR: Not used	
C421, C422, C423	High voltage supply filter	CAPACITOR: 4 mf ±10%; 400 WV	930 4512 00
C424	Mod. trans sec. blocking capacitor	CAPACITOR: 4 mf ±10%; 4000 WV	930 4512 00
C425	Voltage dropping resistor bypass	CAPACITOR: 10,000 mmf ±5%; 2000 WV	938 2114 00
CR201, CR202	Crystal heater voltage rectifier	RECTIFIER: Dry disc	353 3000 00
E201, E202	833A (RF) grid parasitic suppressor	SUPPRESSOR ASSEM: Parasitic; 10 turn coil soldered to 50 ohm ±10%; 22 w resistor	503 0545 002
E203	4-125A grid parasitic suppressor	SUPPRESSOR ASSEM: Parasitic; coil soldered to 50 ohm ±10%; 7 w resistor	502 4720 002

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
E204A, E205A	Audio bay to RF bay interconnecting cable	STRIP: Nine 10-32 x 5/16" screw term	367 0060 00
E204B, E204C, E204D, E205B, E205C, E205D	Audio bay to RF bay interconnecting cable	STRIP: Twelve 8-32 x 5/16" screw term	367 5120 00
E206A, E206B, E206C, E206D	Tuning motors connector	STRIP: Five 6-32 x 3/16" screw term	367 4050 00
E207A, E207B	Blower motor connector	STRIP: Two 6-32 x 1/4" screw term	367 4020 00
F201, F202	Crystal heater fuse	FUSE: Cartridge; 2 amp; 250 v	264 4070 00
F203, F204, F401, F402, F403	HV filter fuse capacitor	FUSE: #36 solid copper wire; approx 1-1/2" lg	
		SPRING: Shorting; brass spring wire #20 Ga W & M	503 0489 001
		SPRING: Fuse clip; spring steel wire #22 Ga W & M	503 0488 001
I101	Crystal heat pilot lamp	LAMP: Miniature bayonet base; 6.3 v; .15 amp	262 3240 00
I301	Filament Pilot lamp	LAMP: Candelabra bayonet base 120 v; 6 w	262 0041 00
I302	Time delay relay pilot lamp	LAMP: Candelabra bayonet base 120 v; 6 w	262 0041 00
I303	D-C overload pilot lamp	LAMP: Candelabra bayonet base 120 v; 6 w	262 0041 00
I304	Plate power pilot lamp	LAMP: Candelabra bayonet base 120 v; 6 w	262 0041 00
J201, J202	RF exciter	CONNECTOR: Socket; 10 contacts	364 2100 00
J203, J204	Rectifier unit	CONNECTOR: Socket; 30 term wall mtg; 10 amp contacts	370 2025 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
J205, J206	Door cable	CONNECTOR: Socket; 30 term right angle; 10 amp cont	370 2023 00
K201, K202	Crystal heating control relay	RELAY: Telephone type; coil: 6-12 v DC, 2500 ohm; contacts: 2PNC 3 amp, 150 w AC	970 1002 00
K203	Tune relay	RELAY: Coil; 230 v AC, 50/60 cps; contacts: DPDT, 115 v, 10 amp	405 0119 00
K401	Filament contactor	RELAY: Power contactor, coil: 230 v, 60 cps; contacts: main, 3 PNO, 25 amp; aux, NO	405 0010 00
K402	Time delay for low voltage	RELAY: Time delay; motor; 230 v, 60 cps, single phase; contacts: 5 amp at 230 v	402 0012 00
K403	Low voltage plate relay	RELAY: Power contactor; coil: 220 v, 60 cps; contacts: 4 NO, 10 amp	405 0041 00
K404	High voltage plate relay	RELAY: Power contactor; coil: 230 v, 60 cps; contacts: main, 3 PNO, 25 amp; aux: NO	405 0010 00
K405	Sequence start relay	RELAY: Power contactor, coil: 220 v, 60 cps; contacts: 2NO, 2NC, 10 amp	405 0045 00
K406	Impulse 1 relay	RELAY: Coil: 230 v; contacts: main, DPDT, 30 amp, 115 v AC, aux: SPDT, 10 amp	405 0121 00
K407	Overload Auxiliary relay	RELAY: Power contactor; coil: 220 v, 60 cps; contacts: 2NO, 2NC, 10 amp	405 0045 00
J408	Impulse 2 relay	RELAY: Coil; 230 v; contacts: main, DPDT, 30 amp, 115 v AC; aux: SPDT, 10 amp	405 0121 00
K409	Five second time delay relay	RELAY: Motor: 230 v; 60 cps, single phase; contacts: 5 amp at 230 v	402 0015 00
K410		RELAY: Not used	
K411	Low power relay	RELAY: Coil: 230 v AC, 50/60 cps; contacts: DPDT, 115 v, 10 amp	405 0119 00
K412	Power amp overload relay	RELAY: 1.5 amp continuous, 1NO-1NC	405 0103 00
K413	Modulator overload relay	RELAY: 1.5 amp continuous, 1NO-1NC	405 0103 00
K414	4-125A overload relay	RELAY: 0.5 amp continuous, 1NO-1NC	405 0102 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
L101	Oscillator cathode RF choke	COIL: 2.5 mh ±10%; 0.125 amp	240 5300 00
L102	Oscillator plate RF choke	COIL: 2.5 mh ±10%; 0.125 amp	240 5300 00
*L201	Power amp plate tank inductor 540-700 kc	COIL ASSEM: Coil: 50-1/2 turns edgewise wound copper ribbon	503 1155 004
	700-900 kc	COIL ASSEM: Coil; 36-1/2 turns edgewise wound copper ribbon	503 1156 004
	900-1200 kc	COIL ASSEM: Coil; 32-1/2 turns edgewise wound copper ribbon	503 1157 004
	1200-1600 kc	COIL ASSEM: Coil; 27-1/2 turns edgewise wound copper ribbon	503 1158 004
*L202	T section input Inductor 540-700 kc	COIL: 80-1/2 turns edgewise wound copper ribbon	503 1153 004
	700-900 kc	COIL: 80-1/2 turns edgewise wound copper ribbon	503 1153 004
	900-1200 kc	COIL: 65-1/2 turns edgewise wound copper ribbon	503 1154 004
	1200-1600 kc	COIL: 65-1/2 turns edgewise wound copper ribbon	503 1154 004
*L203	T section output inductor 540-700 kc	COIL: 80-1/2 turns edgewise wound copper ribbon	503 1153 004
	700-900 kc	COIL: 80-1/2 turns edgewise wound copper ribbon	503 1153 004
	900-1200 kc	COIL: 65-1/2 turns edgewise wound copper ribbon	503 1154 004
	1200-1600 kc	COIL: 65-1/2 turns edgewise wound copper ribbon	503 1154 004
L204	Modulation monitor coil assembly	COIL ASSEM:	503 0625 003

* Choose RF tank components for frequency range applicable to individual transmitter.

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
L205	Power amp plate RF choke	COIL: Choke; 3 mh	503 1038 002
*L206	Neutralizing coil 540-700 kc	COIL ASSEM:	503 1149 004
	700-900 kc	COIL ASSEM:	503 1150 004
	900-1200 kc	COIL ASSEM:	503 1151 004
	1200-1600 kc	COIL ASSEM:	503 1152 004
L207		COIL: Not used	
*L208	Int amp plate tank inductor 540-700 kc	COIL: 59-1/2 turns edgewise wound copper ribbon	503 1163 004
	700-900 kc	COIL: 59-1/2 turns edgewise wound copper ribbon	503 1163 004
	900-1200 kc	COIL: 44-1/2 turns edgewise wound copper ribbon	503 1164 004
	1200-1600 kc	COIL: 44-1/2 turns edgewise wound copper ribbon	503 1164 004
L209	Class A buffer plate RF choke	COIL: 2.5 mh ±10%; 0.125 amp	240 5300 00
L210	Buffer amp plate RF choke	COIL: 2.5 mh ±10%; 0.5 amp	240 2500 00
L211	4-125A RF grid choke	COIL: 2.5 mh ±10%; 0.5 amp	240 2500 00
L212	4-125A RF plate choke	COIL:	571 0460 10
L213*	Buffer amp plate tank inductor 540-700 kc	COIL ASSEM:	503 0627 003
	700-900 kc	COIL ASSEM:	503 0627 003
	900-1200 kc	COIL ASSEM:	503 0628 003
	1200-1600 kc	COIL ASSEM:	503 0628 003

* Choose RF tank components for frequency range applicable to individual transmitter.

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
L214, L215	Low voltage filter choke	REACTOR: 6 hy 40 ohm, .5 amp	678 0096 00
L216, L217	866A's plate choke	REACTOR: 1 hy CT; 30 ohm, .25 amp DC	678 0095 00
L218	High voltage filter choke	REACTOR: 12 hy 32 ohm; 1.62 amp DC	678 0094 00
L219	Buffer RF screen Choke	COIL: 2; 1 mh ±10%, .125 amp	240 2300 00
L220	Power amp plate low pass filter choke	COIL:	508 0680 20
L221	807 plate parasitic	COIL:	503 0535 001
L401	Modulation reactor	REACTOR: Modulation; 50 hy, .65 amp DC; 30-10,000 cps	678 0130 00
M101	Oscillator cathode	METER: 0-50 ma scale	450 0013 00
M201	RF line current	METER: RF thermoammeter; 0-5 amp scale	451 0025 00
M301	Filament Voltmeter	METER: 0-15 v scale	452 0008 00
M302	Test	METER: 0-25 and 0-250 ma DC	458 0019 00
M303	Int amp cathode current	METER: 0-300 ma scale	450 0041 00
M304	Power amp grid current	METER: 0-500 ma scale	450 0042 00
M305	Power amp plate current	METER: 0-1000 ma scale	450 0044 00
M306	Power amp plate voltage	METER: 0-3KV scale	458 0034 00
M307	Modulator cathode current	METER: 0-400 and 0-800 ma DC	458 0020 00
M308	Remote antenna current	METER: RF thermo-ammeter 0-5 amp scale	459 0008 00
P101	Oscillator	CONNECTOR: 10 prong chassis mtg plug	363 2100 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
P203, P204	Door cable	CONNECTOR: 30 term straight plug; 10 amp cont	370 2024 00
P301, P302	Control door	CONNECTOR: 30 term wall mtg receptacle; 10 amp contacts	370 2026 00
R101	Oscillator grid	RESISTOR: 51,000 ohm ±5%; 2 w	745 5158 00
R102	Oscillator cathode	RESISTOR: 100 ohm ±10%; 10 w	710 1100 20
R103	Oscillator plate	RESISTOR: 1000 ohm ±10%; 2 w	745 5086 00
R201	M306 meter multiplier	RESISTOR: 3 megohm ±1/2 of 1%; 3 w	732 0002 00
R202	M306 meter shunt	RESISTOR: 43,000 ohm ±5%; 2 w	745 5154 00
R203	K412 relay shunt	RESISTOR: 2 ohm ±5%; 10 w	710 12 10 00
R204	Power amp grid	RESISTOR: 2000 ohm ±5%; 200 w	710 7246 10
R205, R206	Crystal heat Pilot lamp resistor	RESISTOR: 75 ohm ±10%; 10 w	710 1752 00
R207	Osc. bleeder	RESISTOR: 10,000 ohm ±5%; 10 w	710 1104 10
R208	Osc. screen dropping	RESISTOR: 2400 ohm ±5%; 10 w	710 0230 00
R209	Osc. plate dropping	RESISTOR: 4700 ohm ±10%; 50 w	710 0764 00
R210	Buffer grid	RESISTOR: 3900 ohm ±10%; 2 w	745 5111 00
R211	Buffer parasitic	RESISTOR: 47 ohm ±10%; 1 w	745 3030 00
R212, R213	Buffer amp parasitic	RESISTOR: 47 ohm ±10%; 1 w	745 3030 00
R214	Buffer screen	RESISTOR: 47 ohm ±10%; 1 w	745 3030 00
R215, R216	Buffer amp screen	RESISTOR: 47 ohm ±10%; 1 w	745 3030 00
R217	Buffer cathode	RESISTOR: 560 ohm ±10%; 10 w	710 0214 00
R218	Buffer cathode metering	RESISTOR: 20 ohm ±1%; 2 w	722 0127 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
R219	Buffer amp grid	RESISTOR: 4700 ohm ±10%; 2 w	745 5114 00
R220	Buffer amp grid metering	RESISTOR: 208 ohm ±1%; 1 w	722 0031 00
R221	Buffer amp cathode	RESISTOR: 330 ohm ±10%; 25 w	710 0318 00
R222	Buffer amp cathode metering	RESISTOR: 20 ohm ±1%; 2 w	722 0127 00
R223	807's screen dropping	RESISTOR: 22,000 ohm ±10%; 25 w	710 0373 00
R224	Int. amp screen	RESISTOR: 4700 ohm ±10%; 50 w	710 0764 00
R225	Int amp grid	RESISTOR: 5100 ohm ±5%; 10 w	710 0249 00
R226	Int amp gridmeter shunt	RESISTOR: 208 ohm ±1%; 1 w	722 0031 00
R227	Low voltage bleeder	RESISTOR: 12,000 ohm ±10%; 50 w	710 0777 00
R228	Modulator bias bleeder	RESISTOR: 150 ohm ±5%; 25 w	710 0556 00
R229, R230	Modulator bias rheostat	RESISTOR: 300 ohm; 50 w	736 3002 00
R231, R232, R233, R234	HV bleeder	RESISTOR: 12,000 ohm ±10%; 100 w	710 0932 00
R235	K414 relay shunt	RESISTOR: 39 ohm ±10%; 10 w	710 0181 00
R236	Audio monitor gain control	RESISTOR: 200 ohm, 0.14 amp	377 0005 00
R237	Audio monitor loading	RESISTOR: 560 ohm ±10%; 2 w	745 5076 00
R238	Audio monitor loading	RESISTOR: 150 ohm ±10%; 2 w	745 5051 00
R239	Remote ant. current meter shunt	RESISTOR: 25 ohm, 0.40 amp	377 0003 00
R301	Meter shunt	RESISTOR: 43,000 ohm ±5%; 2 w	745 5154 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
R302, R303, R304, R305	Pilot lamp resistor	RESISTOR: Fixed; 3900 ohm ±10%; 25 w	710 0350 00
R401, R402, R403, R404, R405, R406, R407, R408, R409, R410	Feedback network resistor	RESISTOR: ~~0.33~~ 330K ohm ±5%; 2 w	745 5190 00
R411, R412	Modulator cathode meter shunt	RESISTOR: 2.53 ohm ±1%; 1 w	722 0030 00
R413	K413 relay shunt	RESISTOR: 2 ohm ±5%; 10 w	710 1210 00
R414, R415	AF voltage divider	RESISTOR: Fixed; 5100 ohm ±5%; 2 w	745 5116 00
R416	6N7's cathode metering shunt	RESISTOR: 208 ohm ±1%; 1 w	722 0031 00
R417	6N7's cathode	RESISTOR: 1000 ohm ±10%; 2 w	745 5086 00
R418	Speech amp voltage dropping	RESISTOR: 4700 ohm ±10%; 2 w	745 5114 00
R419, R420	6N7's grid	RESISTOR: 7500 ohm ±5%; 2 w	745 5123 00
R421, R422	Audio driver grid filter resistor	RESISTOR: 20,000 ohm ±5%; 2 w	745 5140 00
R423, R424	Audio driver grid	RESISTOR: Fixed; 0.24 megohm ±5%; 2 w	745 5186 00
R425	845's bias resistor	RESISTOR: 750 ohm ±5%; 25 w	710 0581 00
R426	Meter shunt	RESISTOR: 20 ohm ±1%; 2 w	722 0127 00
R427, R428, R429, R430	Part of 600 ohm input pad	RESISTOR: Fixed; 100 ohm ±10%; 1 w	745 3044 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
R431, R432	Part of 600 ohm input pad	RESISTOR: Fixed; 390 ohm ±10%; 1 w	745 3069 00
R433, R434, R435, R436	Part of PA plate dropping pad	RESISTOR: 6200 ohm ±5%; 200 w	710 1869 00
R437, R438, R439, R440	Audio amp plate resistor	RESISTOR: 24,000 ohm ±5%; 2 w	745 5144 00
S201	Power amp plate power	SWITCH: Knife; SPST: 25 amp	260 4010 00
S202	Crystal heater switch	SWITCH: Two pole, 2 position; non-shorting	259 1100 00
S203	Oscillator selector	SWITCH: 4 circuit, shorting; 2 position	259 0028 00
S204, S205, S206	Door interlock	SWITCH: Female contact assembly	260 4050 00
		SWITCH: Male contact assembly	260 4040 00
S207	HV shorting	SWITCH:	503 0514 002 503 0486 001
S208	HV shorting	SWITCH:	503 0498 001 503 0486 001
S301	Filament start-stop station	SWITCH: 600 v AC 5 amp	260 0521 00
S302	Power level	SWITCH: Non-shorting; 3 pos, 2 circuit, 2 gang, 10 amp	259 1300 00
S303	Test meter	SWITCH: Non-shorting 6 pos, 2 circuit	259 0027 00
S304	Tune meter switch	SWITCH: Non-shorting 6 pos, 6 circuit, 3 deck	259 0029 00
S305	Tuning control	SWITCH: Jack; DPDT; off normal	260 3080 00
S306	Plate power start-stop station	SWITCH: 600 v AC; 5 amp	260 0521 00

20T PARTS LIST

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
S401	Control circuit breaker	SWITCH: 2 overload coils, 1 amp; cont: 50 amp	260 0251 00
S402	Filament low voltage circuit breaker	SWITCH: Three overload coils, 8 amp AC; cont: 50 amp	260 0426 00
S403	High voltage circuit breaker	SWITCH: Three overload coils, 15 amp AC; cont: 50 amp	260 0429 00
S404, S405, S406	Door interlock	SWITCH: Female contact	260 4050 00
		SWITCH: Male contact	260 4040 00
S407	HV shorting	SWITCH:	503 0520 002 503 0486 001
S408	HV shorting	SWITCH:	503 0498 001 503 0486 001
T201, T202	Power amp filament transformer	TRANSFORMER: Pri: 210, 220, 230, 240, 250 v, 50/60 cps; Sec: 10 v CT 20 amp	672 1093 00
T203	Filament transformer for osc buffer and intamp	TRANSFORMER: Pri: 210, 220, 230, 240, 250 v, 50/60 cps; Sec #1: 6.3 v CT, 5 amp; Sec #2: 5 v CT, 7 amp	672 0088 00
T204	Xtal heat transformer	TRANSFORMER: Pri: 115, 210, 220, 230, 240 v, 50/60 cps, Sec: 12.6 v CT, 2.5 amp	672 0086
T205, T206	866A's rect filament	TRANSFORMER: Pri: 210, 220, 230, 240, 250 v, 50/60 cps	672 0085 00
T207	Low voltage plate	TRANSFORMER: Pri: 210, 220, 230, 240, 250 v, 50/60 cps, Sec: 1456 v CT, .354 amp	503 0521 002
T208	8008 rect filament	TRANSFORMER: Pri: 210, 220, 230, 240, 250 v, 50/60 cps, Sec: 5 v CT, 30 amp	672 0089 00
T209	High voltage plate	TRANSFORMER: 3 phase; Pri: 208, 230 v 50/60 cps, Sec: 2260 v .925 amp; DC output and filter; 2628 v, 1.6 amp	674 0090 00
T401, T402	Modulator filament transformer	TRANSFORMER: Pri: 210, 220, 230, 240, 250 v 50/60 cps, Sec: 10 v CT, 20 amp	672 1093 00
T403	Audio input	TRANSFORMER: Pri: 500 ohm CT; 30-15,000 cps ±1 db, Sec: 15,000 ohm CT	677 0092 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
T404	Audio driver	TRANSFORMER: Pri: 12,000 ohm CT, 80 ma balanced Sec: 3500 ohm CT, 50 ma balanced; 30-10,000 cps ±.5 db	677 0132 00
T405	Speech amp filament	TRANSFORMER: Pri: 210, 220, 230, 240, 250 v, 50/60 cps; Sec #1: 10 v CT, 8 amp, Sec #2: 6.3 v CT, 2 amp	672 0087 00
T406	Modulation transformer	TRANSFORMER: Pri: 8200 ohm CT; 290 ma each half balanced, 30-10,000 cps ±.5 db, Sec: 3840 ohm, 850 w	677 0128 00
T407, T408	Constant voltage	TRANSFORMER: Pri: 190-250 v, 60 cyc, single phase; output: 230 v at 93% power factor; 500 VA	664 0026 00
V101	Crystal oscillator	TUBE: 6F6; power amplifier pentode	255 0080 00
V102, V103, V104	Buffer amplifiers	TUBE: 807 beam power amplifier	256 0033 00
V105	Amplifier	TUBE: 4-125A; power tetrode	256 0068 00
V106, V107	Final amplifier	TUBE: 833A; RF power amplifier	256 0063 00
V108, V109	Voltage regulator	TUBE: OC3/VR105; voltage regulator	257 0002 00
V110, V111	Audio amplifier	TUBE: 6N7; twin amplifier	255 0134 00
V112, V113	Driver amplifier	TUBE: 845; AF power amplifier	256 0034 00
V114, V115	Modulator	TUBE: 833A; class B modulator	256 0063 00
V116, V117, V118, V119	L.V. rectifier	TUBE: 866A; half-wave mercury-vapor rectifier	256 0049 00
V120, V121, V122	H.V. rectifier	TUBE: 8008 half-wave mercury-vapor rectifier	256 0073 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
X101	Socket for V101	SOCKET: 8 prong; chassis mtg	220 1830 00
X102, X103, X104	Socket for V102, V103, V104	SOCKET: Ceramic; 5 prong	220 5520 00
X105	Socket for V105	SOCKET: Ceramic; 5 prong	220 1016 00
X106, X107	Socket for V106, V107	SOCKET: Two prong clamp type	220 5210 00
X108, X109, X110 X111	Socket for V108, V109, V110, V111	SOCKET: Ceramic; 8 prong	220 5810 00
X112, X113	Socket for V112, V113	SOCKET: 50 w base, bayonet lock; 4 prong	220 5420 00
X114, X115	Socket for V114, V115	SOCKET: Two prong clamp type	220 5210 00
X116, X117, X118, X119	Socket for V116, V117, V118, V119	SOCKET: 4 prong; bayonet lock; for UX base tubes	220 6410 00
X120, X121, X122	Socket for V120, V121, V122	SOCKET: Super Jumbo 4 prong	220 1028 00
X123	Socket for Y101	SOCKET: Crystal; 5 prong	220 1530 00
X201, X202	Socket for F201, F202	SOCKET: Includes thumb knob for extracting	265 2030 00
X301	Socket for I301	SOCKET: Pilot light assem for 2 contact candelabra bayonet base bulb DISC: Pilot light; green	262 0035 00 262 0037 00
X302	Socket for I302	SOCKET: Pilot light assem for 2 contact candelabra bayonet base bulb DISC: Pilot light; amber	262 0035 00 262 0038 00
X303, X304	Socket for I303, I304	SOCKET: Pilot light assem for 2 contact candelabra bayonet base bulb DISC: Pilot light; red	262 0035 00 262 0036 00
X305	Socket for I101	SOCKET: Pilot light mtg for miniature bayonet base bulbs JEWEL: red	262 1230 00 262 2160 00

SECTION 8

MISCELLANEOUS ILLUSTRATIONS

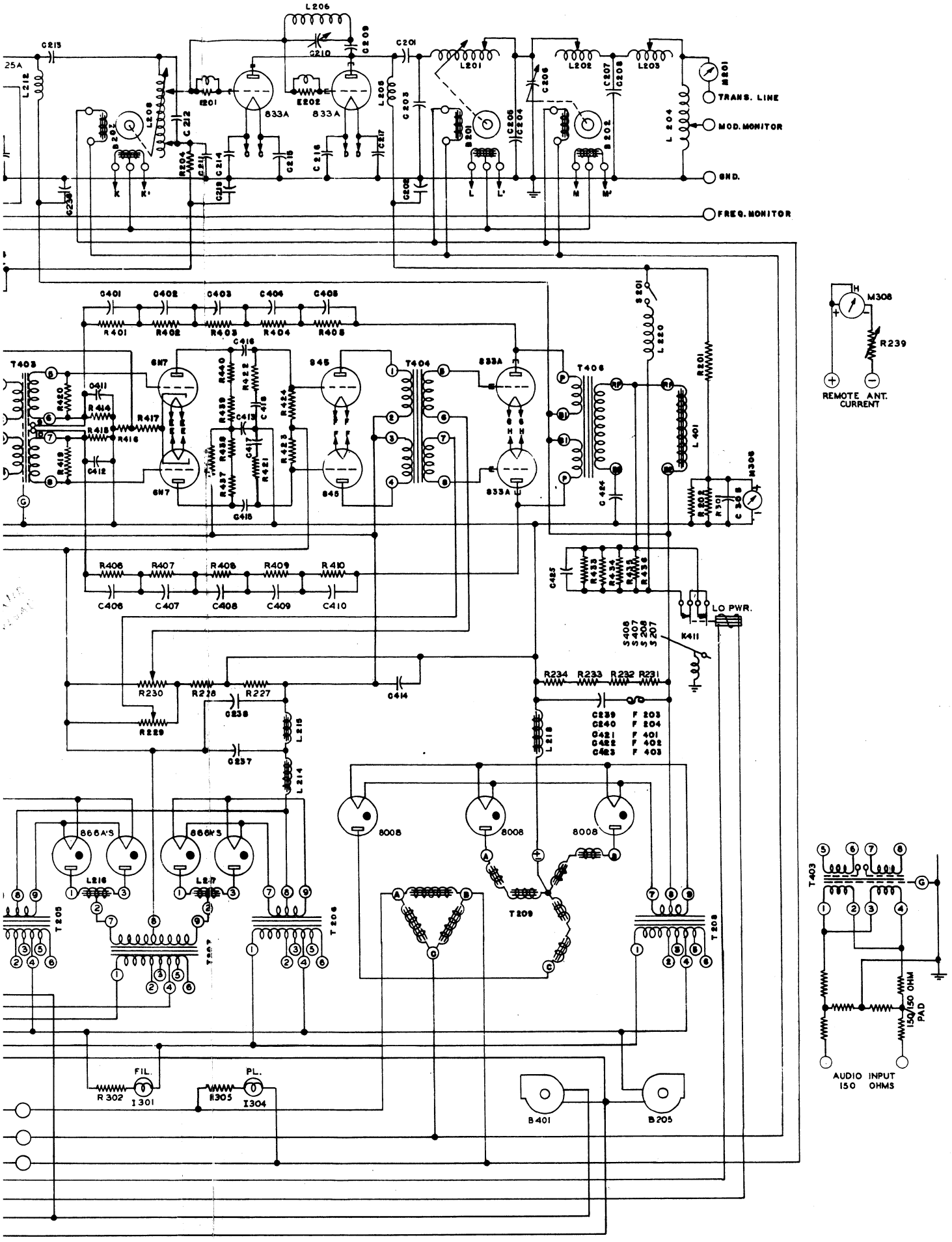
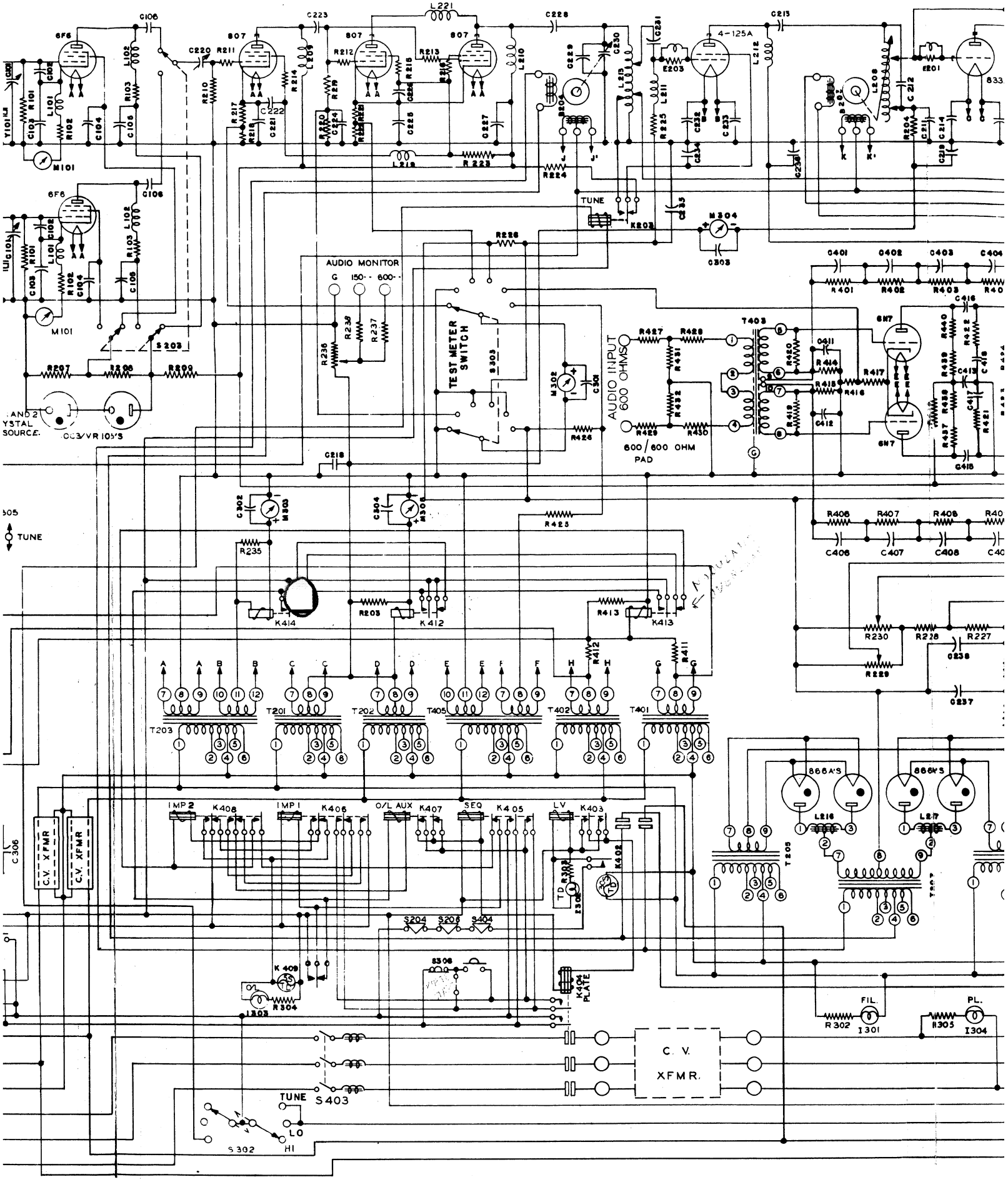
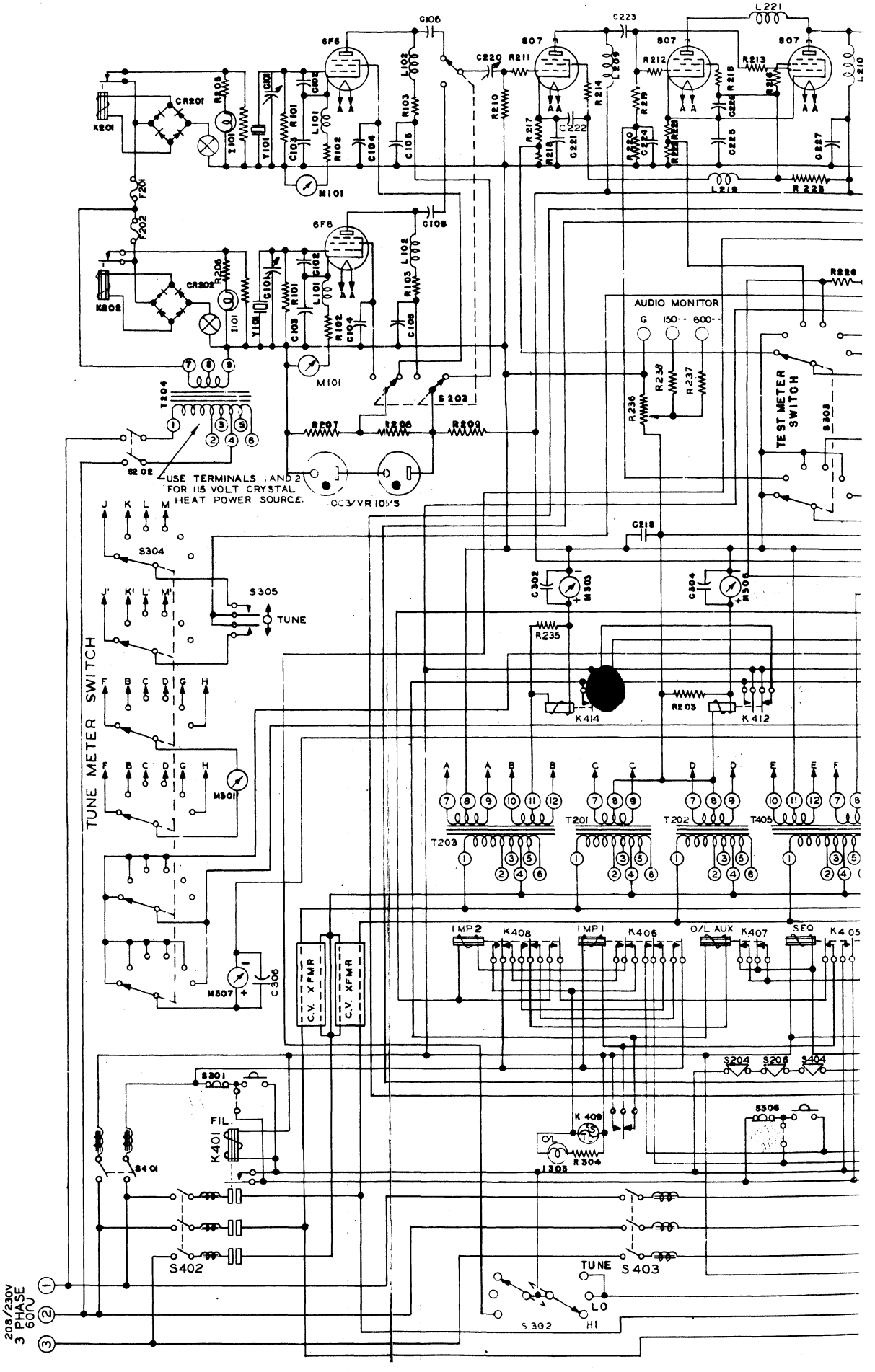


Figure 8-1 20T Complete Schematic Diagram

Figure 8-1 20T Complete Schematic Diagram


6F6
807
4-125A
833
M101
M304
TUNE
K203
AUDIO MONITOR
TEST METER SWITCH
S303
AUDIO INPUT 600 OHMS
600/600 OHM PAD
6N7
T403
K414
K412
K413
T201
T202
T405
T402
T401
T203
IMP 2
K408
IMP 1
K406
O/L AUX
K407
SEQ
K405
LV
K403
866A'S
C.V. XFMR
S204
S205
S404
K409
K404 PLATE
S306
S403
S302
TUNE
LO
HI
C. V. XFMR.
FIL.
PL.
R302
I301
R305
I304


AUDIO MONITOR
TEST METER SWITCH
TUNE METER SWITCH
USE TERMINALS 1 AND 2 FOR 115 VOLT CRYSTAL HEAT POWER SOURCE.
208/230V 3 PHASE 60CY
TUNE
FIL.
C.V. XFMR
C.V. XFMR
IMP 2
IMP 1
O/L AUX
SEQ

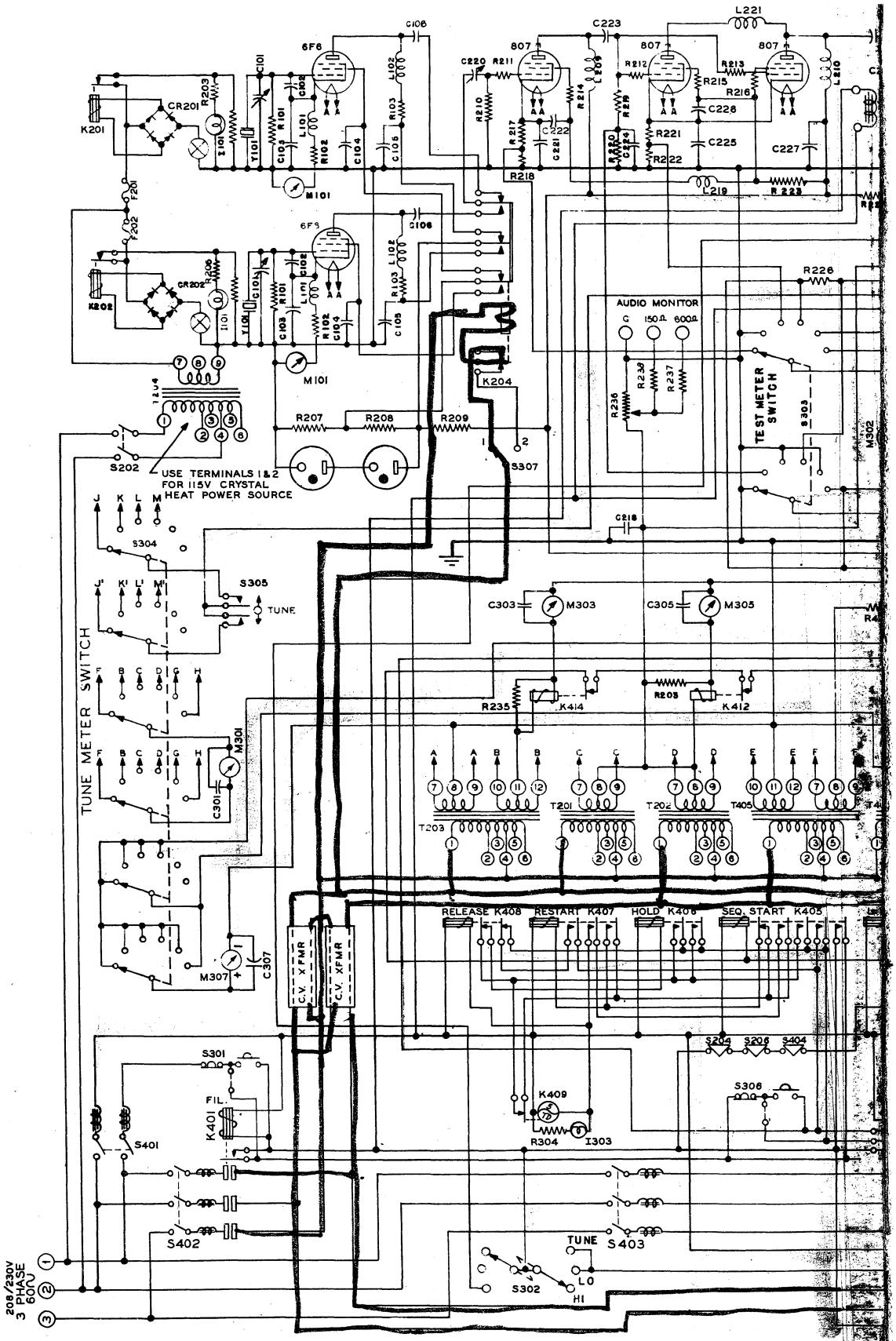
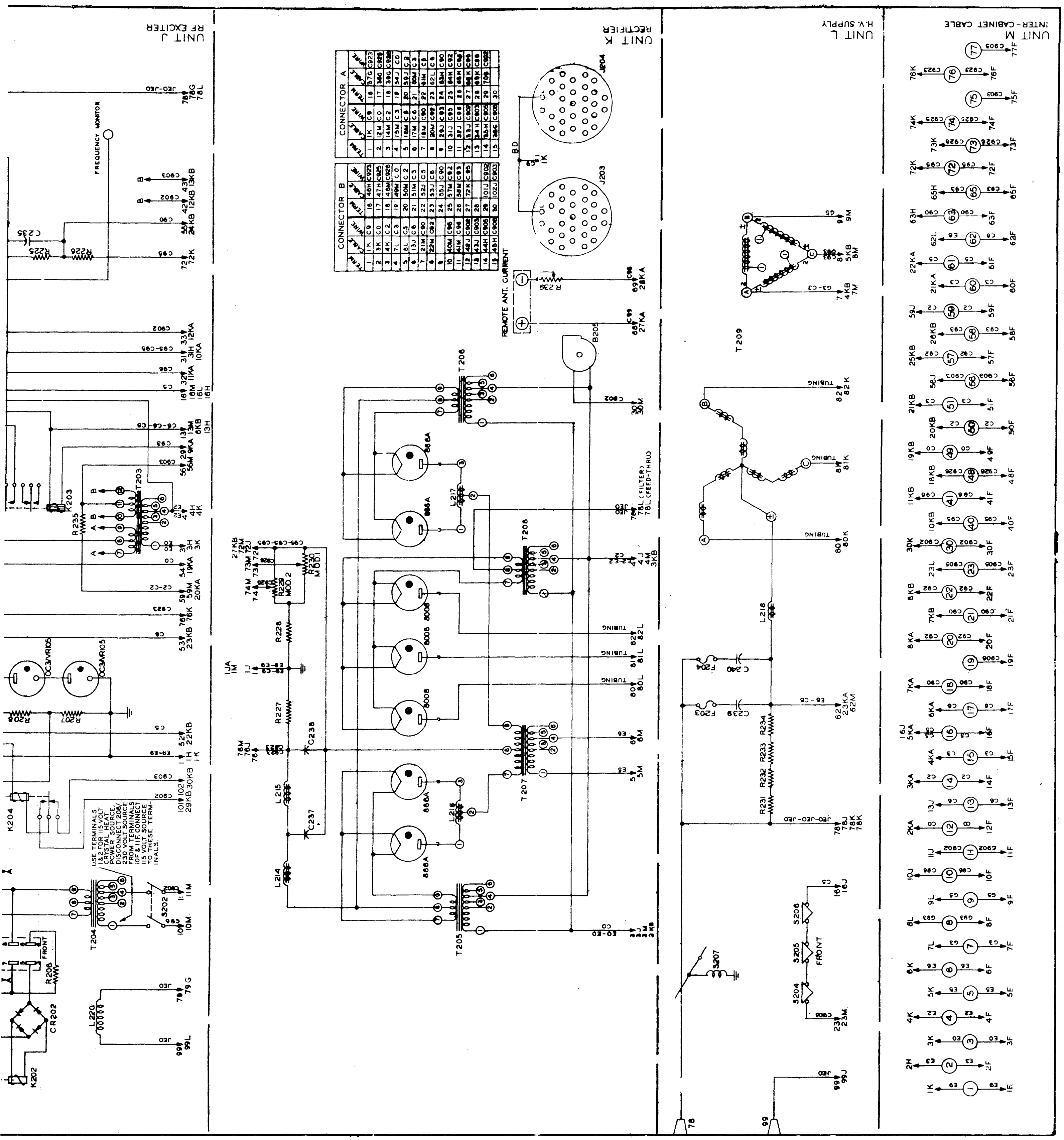

6F6
807
AUDIO MONITOR
TEST METER SWITCH
USE TERMINALS 1&2 FOR 115V CRYSTAL HEAT POWER SOURCE
TUNE METER SWITCH
TUNE
RELEASE K408
RESTART K407
HOLD K406
SEQ. START K405
C.V. XFMR
208/230V 3 PHASE 60CY
TUNE
HI
LO

Figure 8-



ctifier Bay Cabling Schematic

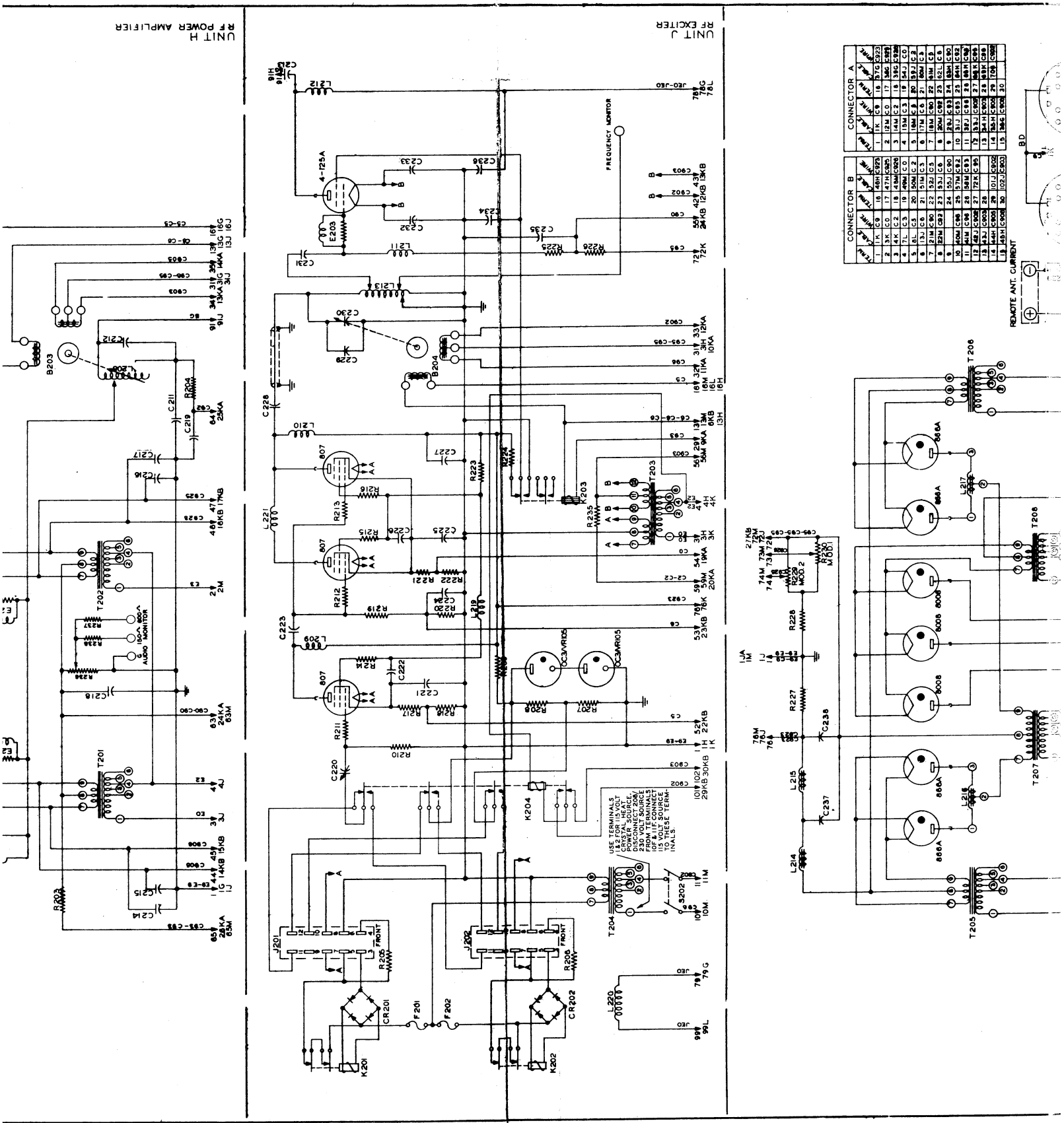


Figure 8-2 R.F. and Rectifier Bay Cabling Schematic

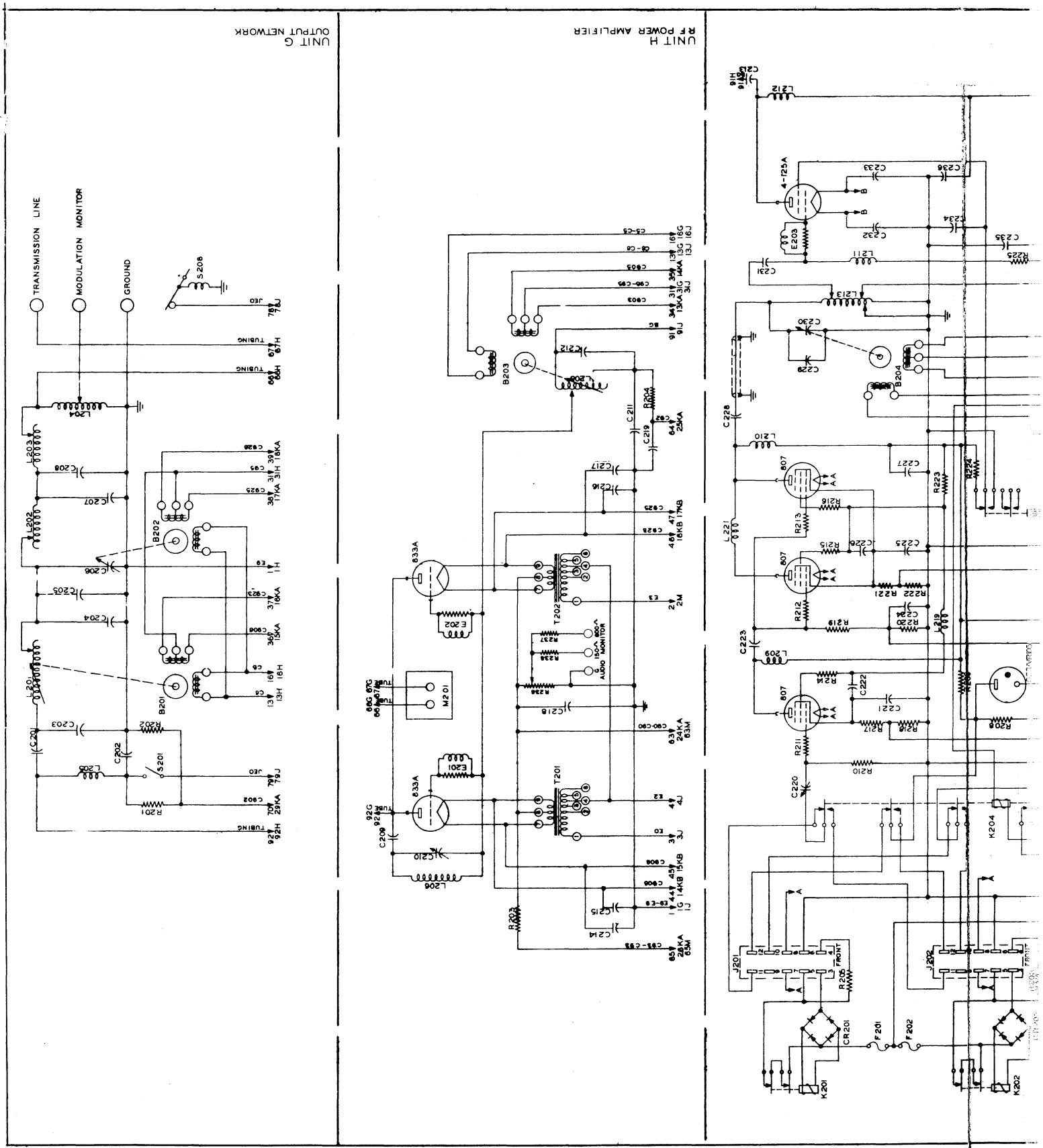
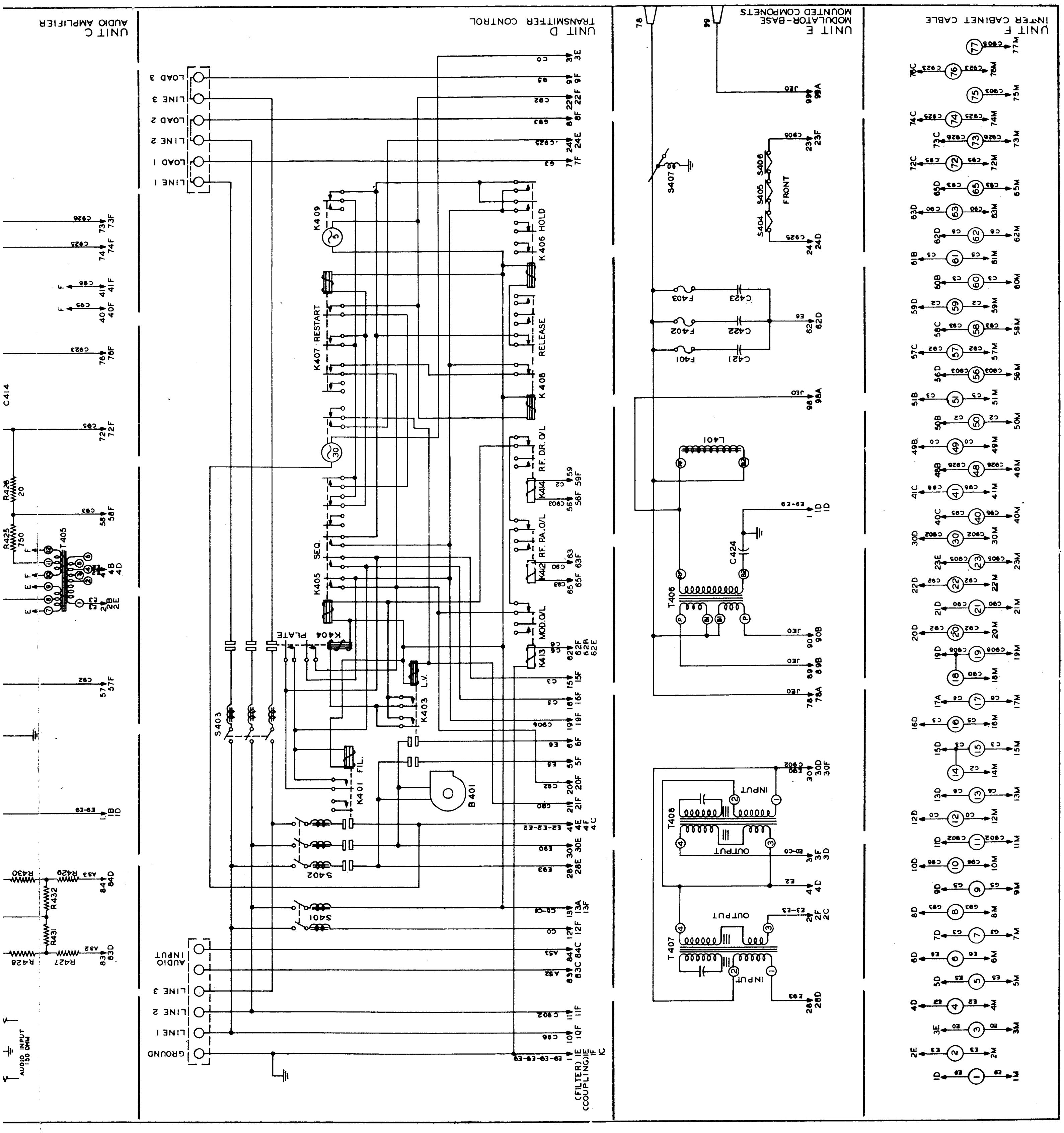


Figure 8-2 R.F. and Rectifi



io and Control Bay Cabling Schematic

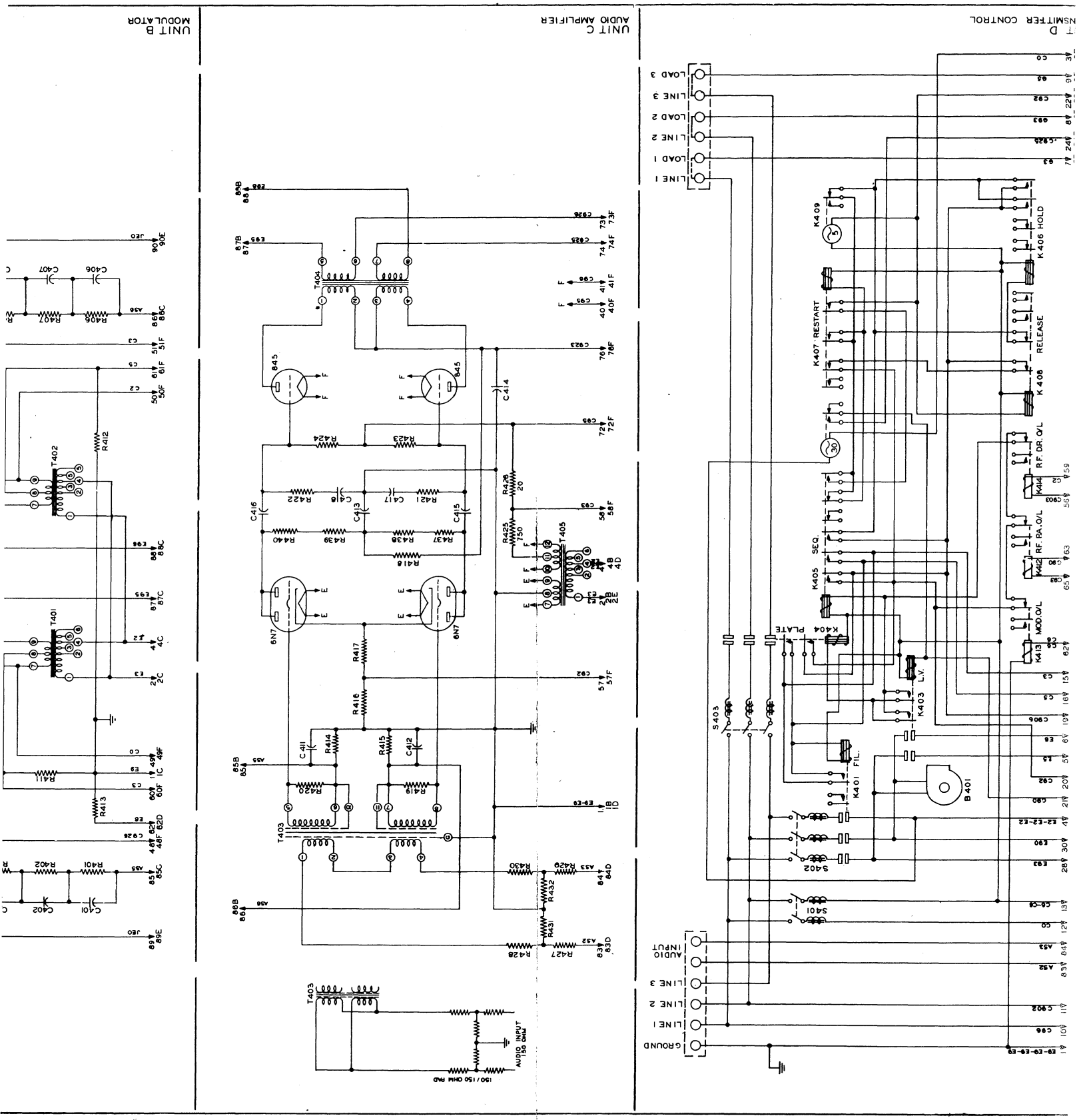


Figure 8-3 Audio and Control Bay Cabling Schematic

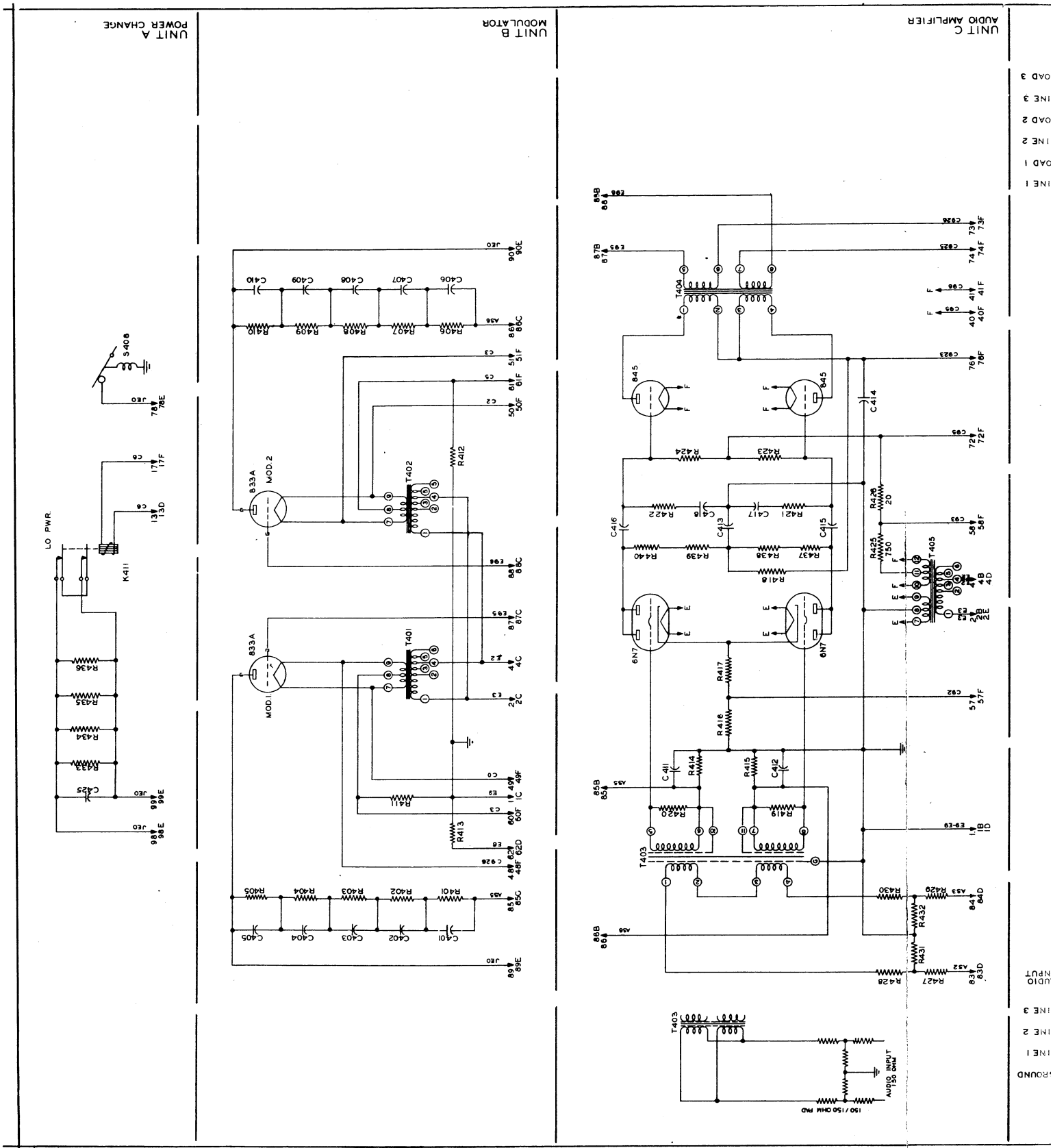


Figure 8-3 Audio and Control Ba

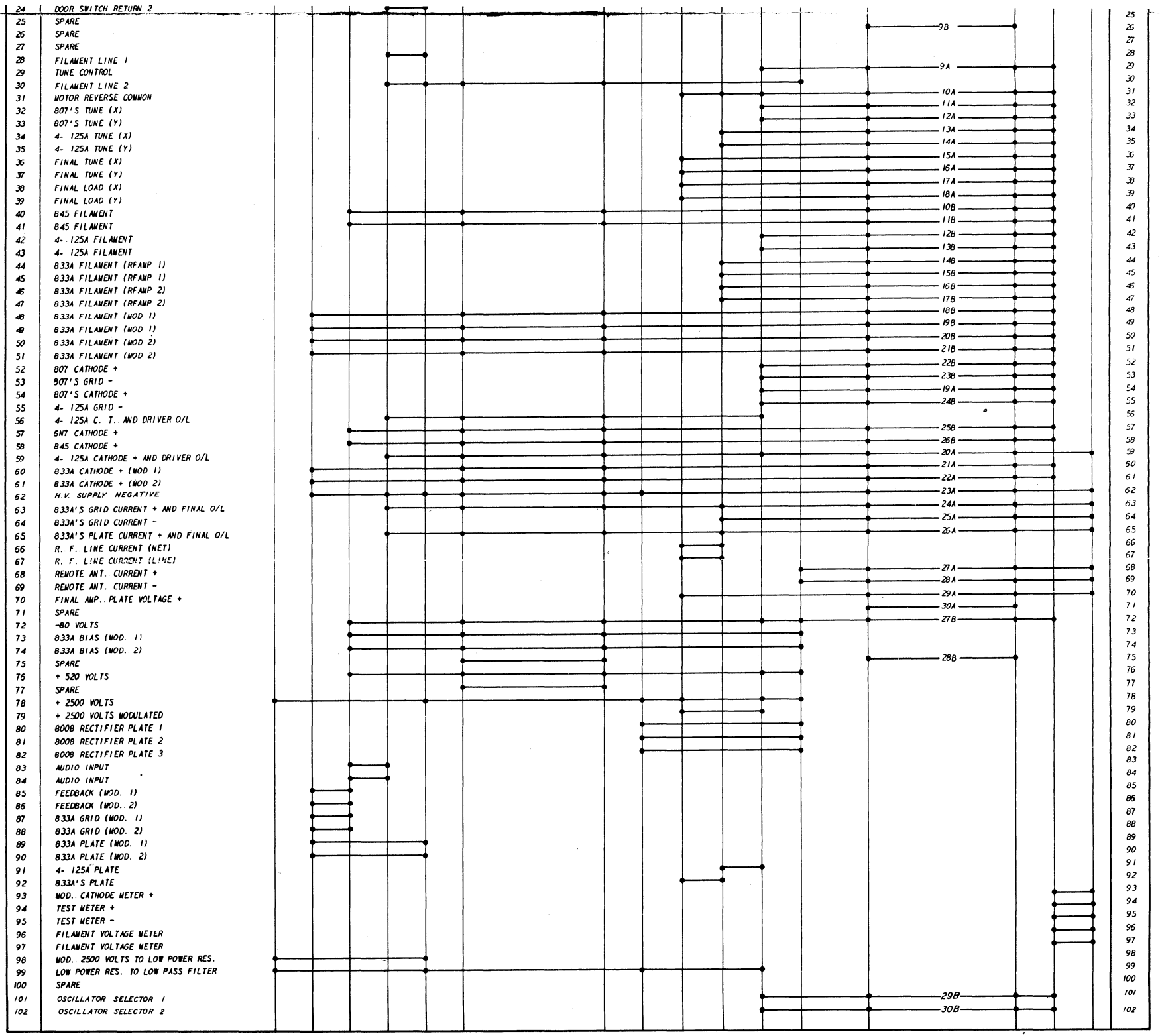


Figure 8-4 Complete Cable Diagram 20T Transmitter

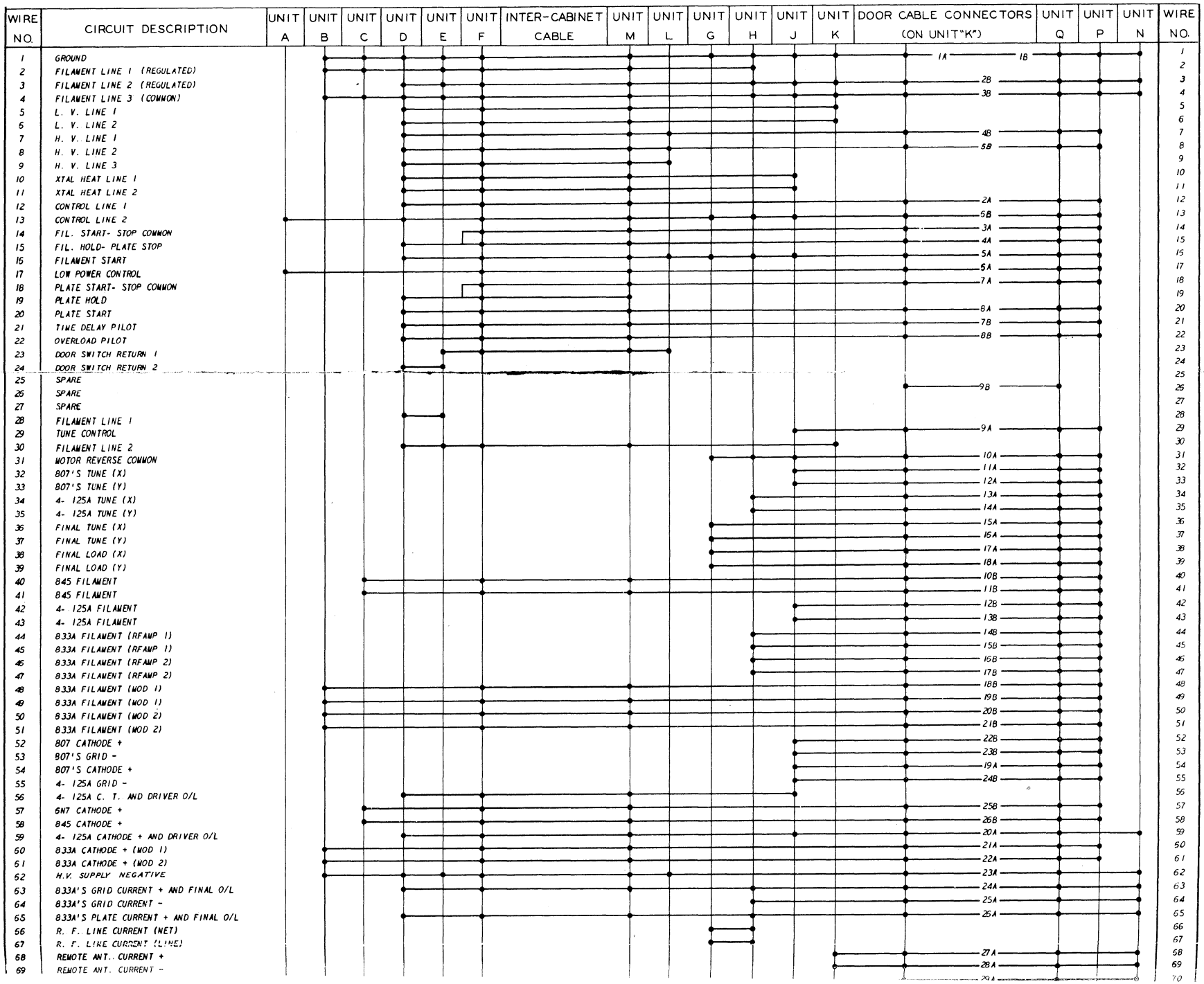
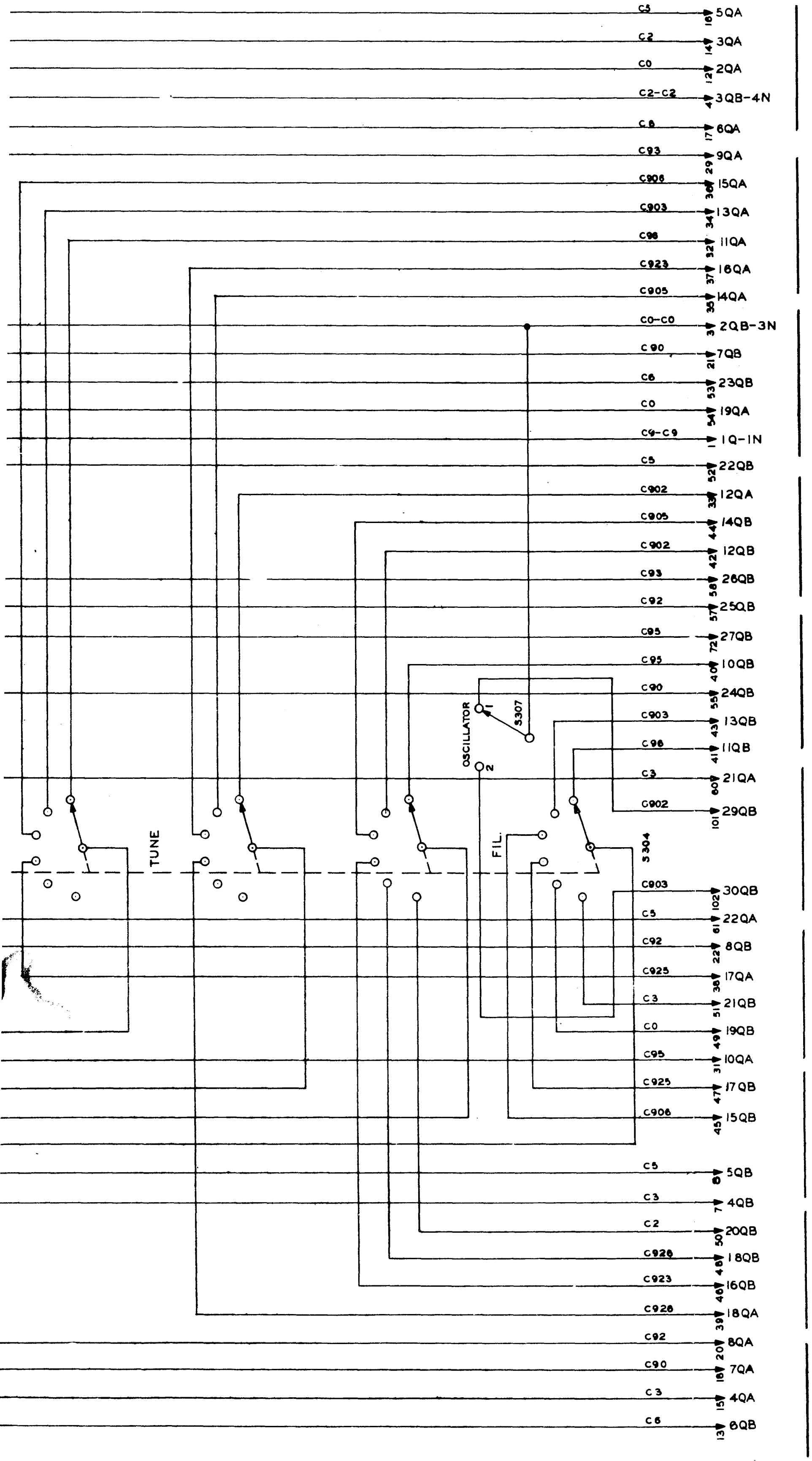


Figure 8-4 Complete Cable Diagram 20T Transmitt

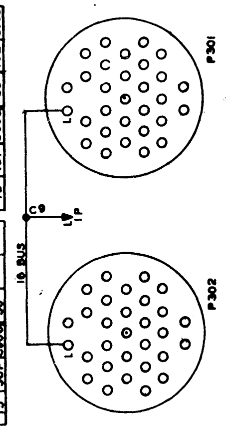


CONNECTOR B

TERM	CABLE	WIRE	TERM	CABLE	WIRE
1	1P	C9	16	46P	C923
2	3P	C0	17	47P	C925
3	4P	C2	18	48P	C926
4	7P	C3	19	49P	C0
5	8P	C5	20	50P	C2
6	13P	C6	21	51P	C3
7	21P	C90	22	52P	C5
8	22P	C92	23	53P	C6
9			24	55P	C90
10	40P	C95	25	57P	C92
11	41P	C96	26	58P	C93
12	42P	C902	27	72P	C95
13	43P	C903	28		
14	44P	C905	29	101	C902
15	45P	C906	30	102	C903

CONNECTOR A

TERM	CABLE	WIRE	TERM	CABLE	WIRE
1	1P	C9	16	37P	C923
2	12P	C0	17	38P	C925
3	14P	C2	18	39P	C926
4	15P	C3	19	54P	C0
5	16P	C5	20	59N	C2
6	17P	C6	21	60P	C3
7	18P	C90	22	61P	C5
8	20P	C92	23	62N	C6
9	29P	C93	24	63N	C90
10	31P	C95	25	64N	C92
11	32P	C96	26	65N	C93
12	33P	C902	27	68N	C95
13	34P	C903	28	69N	C96
14	35P	C905	29	70N	C902
15	36P	C906	30		



UNIT Q
DOOR CONNECTOR

re 8-5 Control Door Cabling Schematic

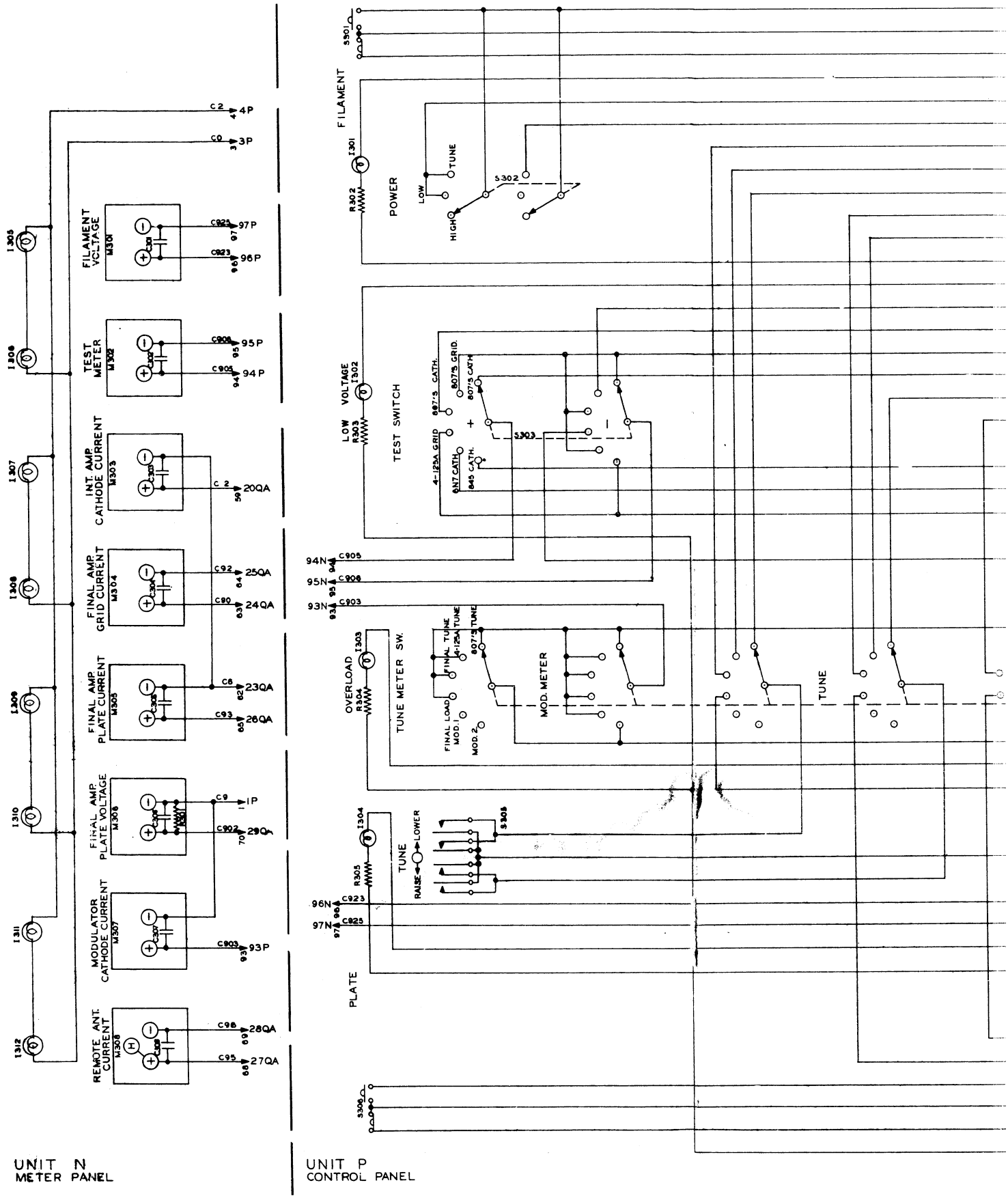


Figure 8-5 Control Door Cabling