INSTRUCTION BOOK

STANDARD ELECTRONICS

TYPE 938 F.M. 5 KW AMPLIFIER

Mr. Zillgen - Sales Mgr.

Area Code 201 - 446-7611

MANUFACTURED BY
STANDARD ELECTRONICS DIVISION
of
REEVES INSTRUMENT CORP.
Lakewood Road
Farmingdale, N. J.

Englishtown, N.J.

5 Kw FM AMPLIFIER

Type 938 amplifier, for use with any 250 watt driver for simplex or multiplex operation.

Designed for the operator of a 250 watt FM broadcasting station, multiplex or simplex, who wishes to increase power output without replacing his present transmitter, the Standard Electronics type 938 amplifier generates a 5kw signal at carrier frequency. In input impedance and in the appearance of its cabinet, this amplifier is matched to the Standard Electronics 250 watt FM transmitter type 930, although it may be connected to any suitable 250 watt FM transmitter as a driver. The amplifier output may be coupled directly to a 50/51½ ohm antenna transmission line.

The amplifier is completely self-contained with built-in power supplies providing all necessary filament, plate and bias voltages. All rectifiers are the semi-conductor diffused-junction silicon diode type, reducing space requirements, power consumption and heat dissipation thus eliminating the cost and inconvenience of tube replacement. Peak inverse voltage rating of each rectifier leg is high enough to provide a generous safety factor, assuring long rectifier life. Rectifier elements can be removed and replaced individually, or, for rapid replacement, an entire rectifier leg may be plugged in as a unit. The bias power supply uses silicon rectifiers in a full wave single-phase bridge circuit and the high-voltage power supply uses them in a full-wave three-phase bridge circuit.

A system of overload relays and circuits, time delays and safety switches protects the amplifier from overloads. "Dead front" design protects personnel so that the front door may be opened while the amplifier is in operation. Interlocks de-energize high voltage circuits before access through the rear door is permitted.

The 5924A power tube is forced air-cooled. Air is drawn in through a filter at the back, circulated through the cabinet, and discharged directly after it leaves the tube anode to prevent overheating other parts of the amplifier. The complete amplifier—including the rf power tube and its associated circuits, the power supplies, cooling fan and control panel—is housed in a standard cabinet 24" wide, 84" high and 22" deep.

"Add-A-Unit" design. Pioneered and proven by Standard Electronics in TV, this feature is now available for the first time in FM to permit a station to start with an economical 250 watt transmitter and later add this 5kw amplifier to boost power while fully utilizing the investment in the transmitter. Input impedance of the 5kw "Add-A-Unit" amplifier is matched to the output of the S-E 250 watt FM transmitter and high quality transmitters of other makes, so that the amplifier may be added without modifying it or the transmitter.

Since this amplifier is designed physically and electrically as a companion to the S-E transmitter, operators already acquainted with the transmitter can readily become familiar with the amplifier. Transmitter and amplifier cabinets closely resemble each other in their modern, functional appearance, permitting a station to maintain continuity of transmitter room decor.

Convenient installation. Unusually compact, self-contained design facilitates installation of the amplifier, simplifying connections to the ac supply, driver and antenna transmission line. The frame will readily pass through doors and elevators. Ac leads can be brought into the cabinet through the top from a ceiling conduit, or through the bottom from a floor trench.

Ease of operation. Operating controls are mounted on the front control panel which is accessible whether the cabinet door is open or closed. All normal adjustments are performed from the front, with switches and dials designed for easy manipulation.

"Patchover" protection to keep a station on the air despite emergencies, another TV-proven feature, is now offered exclusively by Standard Electronics in FM. Identical input and output impedance of the amplifier permits rapid rerouting of rf signal to "patch over" a temporarily inoperative amplifier.

This feature of the amplifier provides full power in reserve with a spare S-E driver only, rather than an entire transmitter line-up. When standby equipment must be used, the spare driver can be readily patched-in to the S-E amplifier and full power operation resumed. In the event of trouble in the amplifier, it can be immediately patched out and the driver connected to the antenna, so that broadcasting can continue at temporarily reduced power while amplifier maintenance is performed.

Simplified maintenance. The amplifier has been designed to reduce maintenance substantially. Multiple metering points, and metering switch and meters accessible from the front of the cabinet, facilitate circuit monitoring. Components are plainly marked for ready identification, and the output tube is easily removable. Cooling air is filtered to keep dust out of the cabinet.

All-around economy. General simplicity of design and the use of semi-conductor power rectifiers reduce first cost and yield savings in energy consumption and tube replacement.

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specifications / 5 kw FM Amplifier Type 938

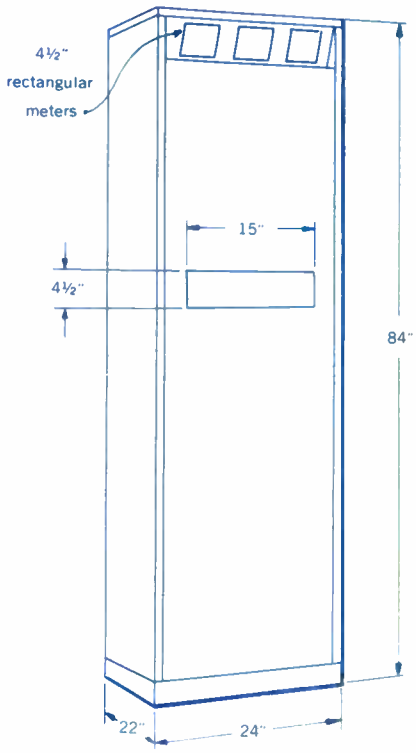
electrical characteristics

Input voltage	208/230 v, 50/60 cps, 3 phase
Total power requirements	Appr. 12 kva at 90% pf
Power output	5 kw FM
Frequency range	88-108 Mc
RF output impedance	50/51.5 ohms
Input impedance	50/51.5 ohms
Band Width	At least 200 kc at carrier frequency

THE STANDARD ELECTRONICS FM AMPLIFIER type 938 meets or exceeds applicable FCC and EIA standards. Specifications subject to modification without notice.

mechanical characteristics

Cabinet dimensions	84″ high, 24″ wide, 22″ deep
Door swing radius, front	21″
back	21″
Finish	3 tone blue and gray
Exhaust air flow	Appr. 350 cfm
Rf input	50/51.5 ohm flexible coax, type N fitting
Rf output	50/51.5 ohm 1⅝″ rigid coax



Cabinet dimensions of S-E 5 kw FM Amplifier

tube complement

Type	Number	FCC spares
5924A	1	1

rectifier complement

Type	Number
F-6	112

Engineering note: The overall response of an FM transmitter using the S-E amplifier is necessarily influenced by the portions of the transmitter preceding the amplifier.

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Form 3151

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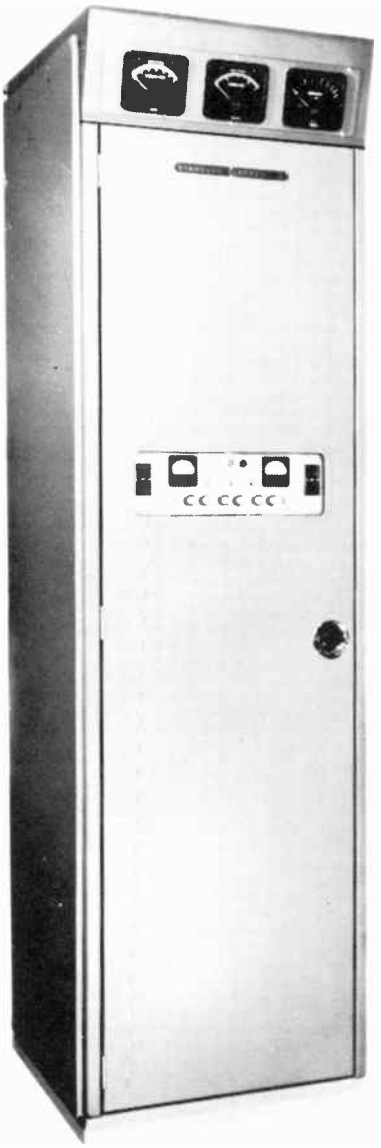


FIG. 1-1 TYPE 938 F.M. 5KW AMPLIFIER

SECTION 1

DESCRIPTION

1-1. General

1-2. The Standard Electronics Type 938 F.M. 5 KW Amplifier delivers a standard frequency modulated r-f signal and meets or exceeds applicable F.C.C. and E.I.A. standards when used with the Standard Electronics 250 watt F.M. Multiplex Transmitter, Type 930 or any suitable 250 watt F.M. driver that meets F.C.C. or E.I.A. standards.

1-3. REFERENCE DATA

1-4. Table 1-1 gives data for quick reference.

Table 1-1. Type 938 F.M. 5 KW Amplifier Reference Data

Input Voltage	208/230V 50/60 cps, 3 phase
Total power requirements	Approximately 12 kva at 90% P.F.
Power output	5 KW F.M.
Efficiency	75%
Frequency range	88-108 Mc
R.F. Output impedance	50/51.5 ohms
Input impedance	50/51.5 ohms
Band Width	At least 200 kc at carrier frequency.

1-5. PHYSICAL CHARACTERISTICS

1-6. The size and weight of a complete equipment are listed in Table 1-2.

Table 1-2. Type 938 F.M. 5 KW Amplifier Physical Characteristics

Depth	Width	Height	Weight
22"	24"	84"	840 Lbs.

Door Swings

Front	Back
21"	21"

Exhaust Air Flow	Approximately 350 CFM
RF Input	50/51.5 ohm flexible coax, type N fitting
RF Output	50/51.5 ohm 1 5/8" rigid coax.

1-7. Tube and Rectifier Complement.

Type	Quantity
5924A	1
F6	108

1-8. DESCRIPTION

1-9. The Amplifier is completely self-contained, with built-in power supplies providing all necessary filament; plate and bias voltages. "Dead front" design of the amplifier protects personnel so that the front door may be opened while the amplifier is in operation. All controls required for normal operating adjustments are mounted on the control panel which is accessible whether the door is opened or closed, see Figure 1-1. Interlocks are provided to deenergize high voltage circuits before access through the rear door is permitted.

1-10. Flexibility of use is covered by the design of the Amplifier. It may be connected as an addition to existing equipment to increase the power level, or installed as original equipment with a Standard Electronics Type 930 250 watt F.M. Transmitter as the driver. The input is to a flat 51.5 ohm section which accepts the output of the driver, without signal degradation.

1-11. SPECIAL FEATURES

a. Provisions for patchover from driver to antenna without disturbing connectors of the amplifier.

b. Provisions for use of the Standard Electronics reflectometer when the amplifier is patched out.

c. Front panel meters for monitoring amplifier operation from a distance.

d. Air cooling of the output tube.

e. Use of silicon diode type rectifiers for reducing space requirements, power consumption and heat dissipation.

1-12. EQUIPMENT SUPPLIED

1-13. The units comprising a complete equipment are listed in Table 1-3, see Figure 5-1.

Table 1-3. Type 938 F.M. 5 KW Amplifier Equipment Supplied.

Unit	Title
S-1789-1	Cabinet
S-1794	Amplifier
S-1795	Control Panel
S-1796	High Voltage Power Supply
S-1797	Accessory Panel
S-1798	Bias Power Supply
S-1799-1	Meter Panel

SECTION 2

INITIAL OPERATION

2-1. GENERAL

2-2. The following procedure is given for initial operation.

2-3. PRELIMINARY

2-4. Prior to initial operation, check the following:

a. The Amperex 5924A tube is seated properly in position and filament, filament center tap connections are tight. (Filament center tap is indicated by the letter "O" stamped on the pin), see Fig. 5-4.

b. Check to see that the following protective panels are in place and secured and high voltage shorting switches are functioning.

1. Accessory panel S-1797 which operates interlock S705 and high voltage shorting switch S710, see Fig. 5-2 and 5-3.

2. Amplifier S-1794 cavity cover which operates interlock S703 and high voltage shorting switch S711.

2-5. INITIAL OPERATION

CAUTION

PLATE POWER breaker CB702 and AC POWER breaker CB701 should be kept in the off position until just before operating.

2-6. When installing the Type 930 F.M. Multiplex Transmitter and the Type 938 5 KW F.M. Amplifier as a complete 5 KW F.M. Transmitter refer to figure 5-4 in the instruction manual for the Type 930 Transmitter and figures 5-6 and 5-8 in this manual for interconnecting information.

a. Connect a 208/230 volt 60 cps three phase and a 115 volt 60 cps single phase source to the appropriate leads in the junction box which is located halfway up on the left rear of the amplifier frame, see Figure 5-2. The three phase source should be protected by a wall mounted 60 ampere breaker and the 115 volt single phase source by a 30 ampere breaker.

NOTE: For 230 V operation, change taps on T703 as shown on transformer.

b. Ground the amplifier frame to the system ground.

c. Connect the output of the driver to the input of the amplifier with a suitable length of RG-87/u cable with type "N" connectors. See Figure 5-2 for r-f input locations.

d. Terminate the amplifier in a dummy load or the antenna by connecting to the 1-5/8 line protruding from the top of the amplifier cabinet, see Fig. 5-2. Check to see that the patch is in position as shown in Figure 5-2.

e. Open the cavity cover on the amplifier S-1794. Check to see that the cavity high voltage shorting switch S711, see Fig. 5-1, is closed. Rotate the Output Tuning Control, see Fig. 5-4, so that the output tuning plates are midway between the cavity wall and the cavity inner conductor.

f. Set a grid dip meter to the operating frequency and couple it to the cavity by holding well into the cavity. Adjust the grid dip meter until a resonance is indicated; if the frequency is too high move the shorting bars, see Fig. 5-4, down and if too low move the shorting bars up. It may be necessary to also change the position of the output tuningplates to bring the cavity into resonance at the operating frequency.

g. Close cavity cover.

h. Turn on AC POWER breaker CB701 and FILAMENT ON-OFF switch S701 on the control panel, see Fig. 5-1. Check to see that FIL ON indicator I707 is on. For 5 KW amplifier (not S.E. driver) adjust filament Transtat T704 for 230V as indicated on FILAMENT PRIMARY meter M701.

NOTE: If this amplifier is part of a complete Standard Electronics 5 KW transmitter, refer to paragraph h above and note the following change:

Delete reference to T704 for adjustment of filament voltage in amplifier. Refer to initial operation procedure 2-5 subparagraphs d and e as outlined in the Instruction Book for the Standard Electronics Type 930 F.M. Multiplex Transmitter. The line voltage corrector T401 AC CONTROL on the driver also adjusts the filament voltage on the 938 Amplifier.

i. After 30 seconds check to see that H.V. READY indicator I708 is on, indicating that all interlocks are actuated.

j. Depress METER SELECTOR switch S707 and set grid bias voltage to approximately 200 volts as indicated by GRID METER M705 by adjusting the BIAS ADJ potentiometer R706, see Figure 5-1.

k. Energize PLATE POWER breaker CB702 and PLATE VOLTAGE switch S706. Check to see that KILOVOLTS PLATE meter M703, on the meter panel, indicates approximately 5300 volts.

l. Turn the RF OUTPUT control on the driver to its minimum position, and the place driver in operation by applying plate voltage.

NOTE: If the amplifier is part of a complete Standard Electronics 5 KW Transmitter, delete paragraphs k and l above and substitute k and l below, also refer to the Instruction Book for the type 930 F.M. Multiplex Transmitter Sections 2 and 3.

K. Energize the PLATE POWER breaker CB702 on the amplifier.

L. Turn the RF OUTPUT control R401 on the driver to its minimum position, and then place the amplifier and driver in operation by energizing the PA OVERLOAD breaker S404 and PLATE VOLTAGE switch S403, both on the Type 930 driver. KILOVOLTS PLATE meter M703 on the amplifier meter panel should indicate approximately 5300 volts.

m. Increase driver output sufficiently so that reflected power may be read on the driver reflectometer, then adjust the amplifier input tuning lines. See Fig. 5-1, for minimum reflected power as indicated on the driver reflectometer.

n. Adjust OUTPUT TUNING control for maximum power as indicated on the KILOWATTS RF POWER meter M706 and minimum plate current on AMPERES PLATE meter M704.

o. Increase driver power and repeat steps m and n.

p. Adjust loading (output coupling loop), OUTPUT TUNING controls, see Fig. 5-4, and drive power until the following conditions are met.

Grid current on GRID METER M705	200MA Approx.
Plate current on AMPERES PLATE METER M704	1.3 Amps.
Power output on KILOWATTS RF POWER METER M706	5 KW

SECTION 3

OPERATION

3-1. GENERAL

3-2. Normal operating procedures for the Type 938 F.M. 5 KW Amplifier as a complete 5 KW F.M. Transmitter, using the Standard Electronics Type 930 F.M.Multiplex Transmitter as the driver or an equivalent driver as given in this section.

3-3. NORMAL OPERATION

a. Turn on AC POWER breaker CB701 and FILAMENT ON-OFF switch S701, on the amplifier control panel.

b. Adjust filament Transtat T704 for 230 V as indicated on FILAMENT PRIMARY meter M701.

NOTE: When amplifier is part of complete Standard Electronics 5 KW Transmitter (using Type 930 F.M. Multiplex Transmitter as driver) delete by above and substitute by below:

b. On the Type 930 F.M. driver energize the A.C. POWER breaker S401, place FILAMENT ON-OFF switch S402 in the ON position and adjust the line voltage corrector T401 AC CONTROL for 230 volts as indicated on meter M402 A.C. VOLTS on the Type 930 driver and FILAMENT PRIMARY meter M701 on the Type 938 Amplifier.

c. After 30 seconds H.V. READY indicator on the amplifier will come on.

NOTE: When using complete 5 KW Transmitter H.V. READY indicator on Type 930 driver will come on after a 60 second delay.

d. Energize PLATE POWER breaker CB702 on the amplifier.

e. Place amplifier and driver in operation by energizing PA OVERLOAD breaker S404 and PLATE VOLTAGE switch S403, both on the Type 930 DRIVER.

f. KILOVOLTS PLATE meter M703 should indicate approximately 5300 volts, AMPERES PLATE meter M704 1.3 amps., KILOWATTS RF POWER meter M706 5 KW, and GRID METER M705 200 ma.

3-3. (Continued)

NOTE: Refer to driver instruction book for normal operating conditions meter readings.

CAUTION

Never energize the amplifier without being connected to the antenna or dummy load.

3-4. SHUT-DOWN PROCEDURE

3-5. Shut-down procedure when not using Standard Electronics Type 930 Driver.

a. Driver must be turned off first before removing plate power from amplifier, refer to instruction book on driver.

b. Place PLATE VOLTAGE switch S706 and PLATE POWER breaker CB702 on the amplifier in the off position.

c. After 5 minutes place the FILAMENT ON-OFF switch and AC POWER breaker CB701 on the amplifier in the off position.

3-6. Shut-down procedure when using Type 930 Amplifier and Type 930 FM driver combination.

a. Place PLATE VOLTAGE ON-OFF switch S403 and PA OVERLOAD breaker S404 on the Type 930 F.M. driver in the off position.

b. Place PLATE VOLTAGE switch S706 and PLATE POWER breaker CB702 on the amplifier in the off position.

c. After five minutes, place the FILAMENT ON-OFF switch S701 and AC POWER breaker CB701 on the Type 938 amplifier in the off position, then throw the FILAMENT ON-OFF switch S402 and the A.C. POWER breaker S401 to OFF.

3-7. OPERATING LOG

3-8. As required by the F.C.C., keep an operating log in which is recorded periodic meter readings. This will aid in preventive maintenance, as a large change in meter readings over short periods of time may indicate a faulty component.

3-9. Table 3-1 lists indicator lights and their condition during normal operation.

TABLE 3-1
TYPE 938 5 KW F.M. AMPLIFIER
Indicator Lights

Nomenclature	Normal Indication
FILE ON	ON
HV READY	ON
HV ON	ON

3-10. Table 3-2 lists typical meter readings.

TABLE 3-2

Meter	Reading
KILOVOLTS PLATE M703	5300 volts
AMPERES PLATE M704	1.3 amperes
KILOWATTS RF POWER M706	5 KW
GRID METER M705	200 ma.
GRID METER M705 (with meter selector switch S707 depressed)	200 volts
FILAMENT PRIMARY M701	230 volts

72-73 9₀

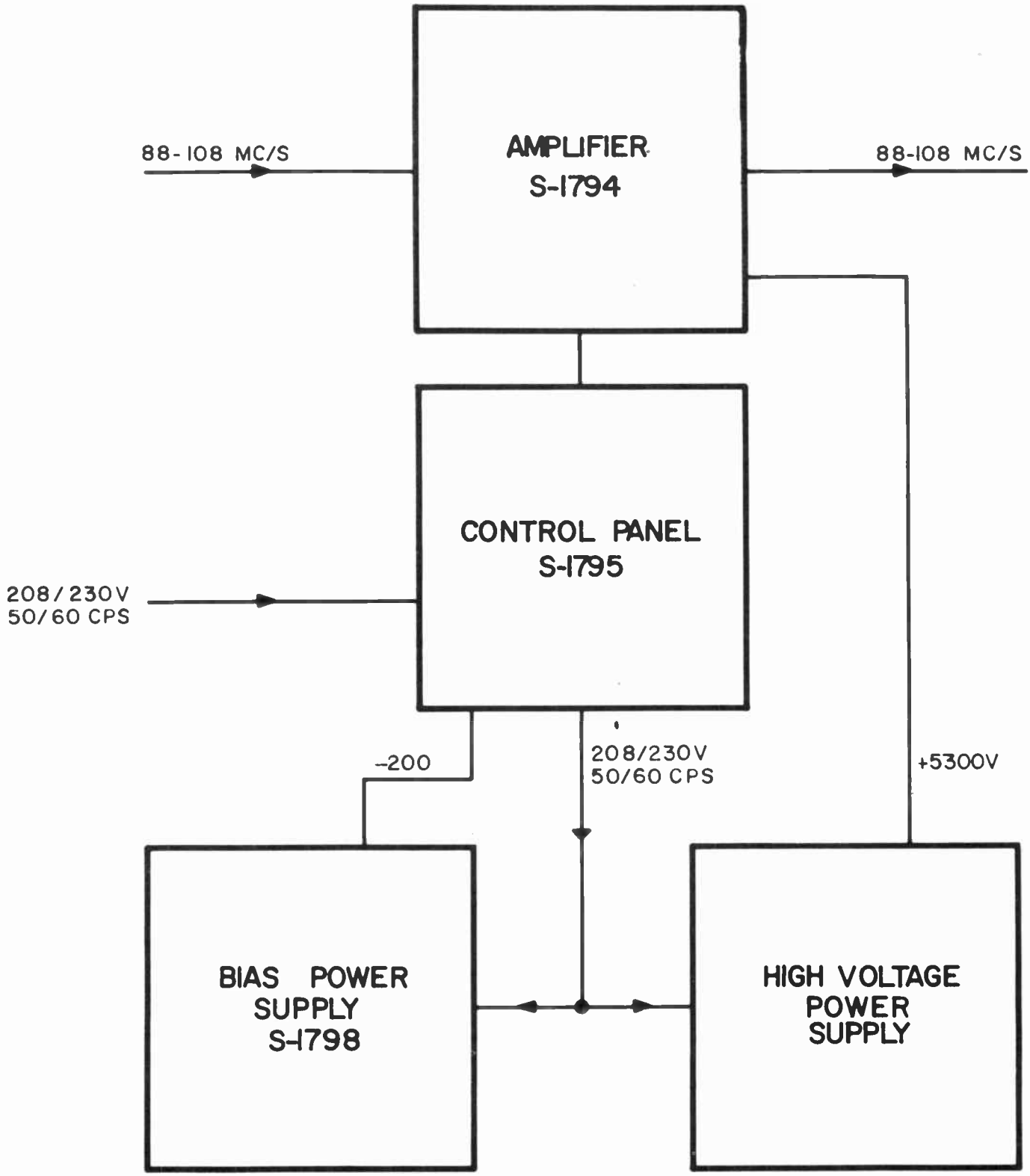


FIG.-4-1

TYPE 938 FM 5KW AMPLIFIER BLOCK DIAGRAM

SECTION 4

THEORY OF OPERATION

4-1. GENERAL

4-2. The Type 938 F.M. 5 KW Amplifier delivers a standard frequency modulated r-f output signal of 5 kilowatts throughout the 88-108 Mc/s F.M. band when used with either the Standard Electronics Type 930 250 watt F.M. Multiplex Transmitter or any equivalent 250 watt F.M. driver that meets F.C.C. or E.I.A. standards.

4-3. CIRCUIT DESCRIPTION

4-4. The type 938 5 KW F.M. Amplifier may be divided into four sections, the Amplifier S-1794, Control Panel S-1795, Bias Power supply S-1798 and High Voltage power supply, see block diagram, Fig. 4-1.

4-5. AMPLIFIER S-1794

4-6. The Amplifier utilizes a single triode V701 type 5924A tube, see Figure 4-2, which is connected and operated as a class B linear grounded grid type amplifier whose output circuit is a cavity that is resonate to the operating frequency.

4-7. The input power from the driver is coupled to the cathose (filament center tap) of V701 via two tuning stubs, see Fig. 4-2 and 5-1. The input tuning system of the amplifier consists of two tuning stubs which are separated by an eighth wave and permits the amplifier to work with any driver and reasonable length of interconnection cable. The input can be tuned to ideal flatness by varying the electrical length of the stubs with the shorting bars on the stubs for minimum reflected power as indicated on the driver reflectometer.

4-8. The output tuning system of the amplifier is a one-quarter wave coaxial line cavity that is forshortened by means of capacitance. The resonate frequency of the cavity is determined by two shorting bars which determine the electrical length of the cavity and two capacitor plates OUTPUT TUNING, see Figure 4-2 and 5-4. The plates are ganged and controlled by a multiturn knob on the front of the cavity. For large changes in frequency, the position of the shorting bars are changed, that is, for a lower frequency the bars are raised to increase the length of the cavity, and for a higher frequency, the shorting bars are lowered.

Variable-loop type coupling is provided to permit adjustable loading of the amplifier to the antenna. Neutralization is accomplished by a small amount of capacitance CN, see Fig. 4-2, which is utilized to neutralize the effect of residual plate cathod capacitance.

4-9. A "patch-over" is supplied in the amplifier to facilitate the operation in case of amplifier failure. By means of the patch-over the amplifier can be removed from the r-f signal path and the driver connected directly to the antenna, thus permitting the operator to work on and, when repaired, can be put onthe air with minimum of lost air time.

4-10. The R.F. Monitor S-1687-1 and its associated meter KILOWATTS RF POWER meter M706 is utilized by the operator to measure both incident (forward power) and reflected power. Switching from forward to reflected power is done by the R.F. MONITOR DIRECT REFLECTED switch S708 which is mounted on the Control Panel S-1795. Two potentiometers CAL DIRECT R721 and CAL REFLECTED R720 are utilized to calibrate the power monitor. When the power meter readings are inserted in the following formula, the SWR toward the load may be determined.

$$SWR = \frac{1 + \sqrt{\frac{P_R}{P_D}}}{1 - \sqrt{\frac{P_R}{P_D}}}$$

The standing wave ratio is found.

PR is the power in KILOWATTS REFLECTED.

PD is the power in KILOWATTS DIRECT.

4-11. CONTROL PANEL S-1795

4-12. The control panel, see Figure 5-1 and 5-8, mounts all controls, protective circuit breakers and fuses required for normal operation. The panel is accessible whether the front door is open or closed. Fuses F701 and F702 10 ampere serve to protect blowers B701 and B702. Fuses F703 and F704 5 ampere protects the filament transformer T201. Fuses F705 and F706 1 ampere are in series withthe interlock circuit and the primary of bias power supply transformer T702.

4-13. BIAS POWER SUPPLY S-1798

4-14. The bias power supply, see Fig. 5-8, furnishes approximately -200 volts to the 5924A tube. The power supply utilizes four diffused junction silicon diodes CR701 through CR704 connected in a single phase full-wave bridge arrangement. The output of the bridge rectifier is filtered by a capacitor input type filter consisting of C704 as the input capacitor, followed by choke L704, and C705 as the output capacitor.

4-15. A safety circuit in the amplifier utilizes the current flow in the bias supply to hold in the bias interlock relay K703, that is, if no bias voltage is available high voltage cannot be applied.

4-16. HIGH VOLTAGE POWER SUPPLY

4-17. The high voltage power supply, see Fig. 5-3 and 5-8, furnishes 5300 volts at up to 2 amperes. The power supply utilizes 108 silicon diodes mounted on six phenolic strips with eighteen per strip. The strips are mounted in place by means of banana plugs and jacks, to permit rapid replacement of a rectifier leg. These diodes and transformer T703 are connected in a three phase full wave delta - delta configuration with a choke input type filter consisting of L705 and C711.

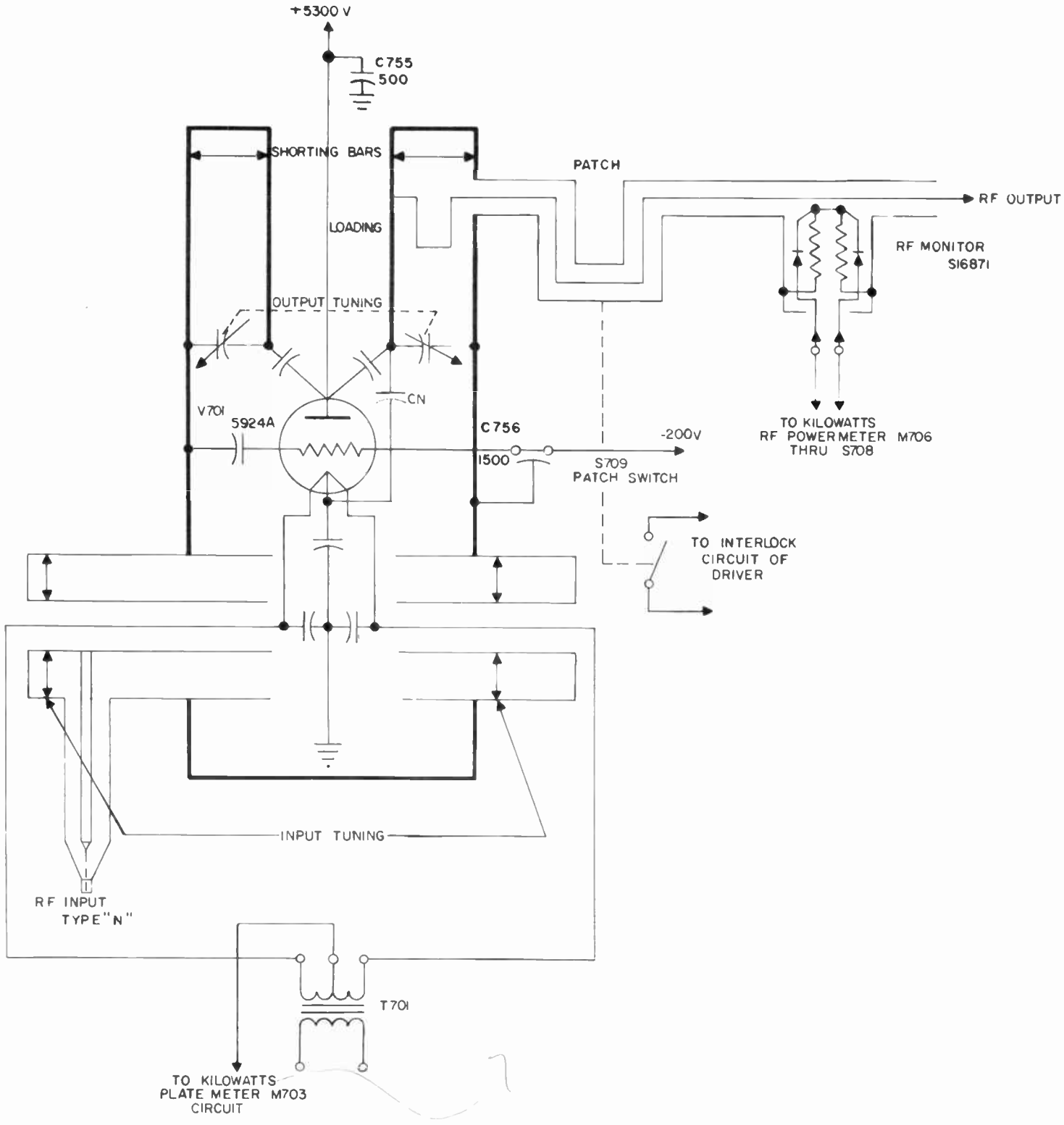


FIG. 4-2 S-1794 AMPLIFIER, SIMPLIFIED SCHEMATIC

SECTION 5

MAINTENANCE

5-1. GENERAL

5-2. This section contains information, photographs and schematics to aid in maintenance and trouble shooting of the equipment.

5-3. MAINTENANCE

5-4. If maintenance is to be performed on the Amplifier, it must be shut down. Follow the procedure for shutting down as outlined in paragraph 3-4.

5-5. There are no lubrication requirements for this equipment. The air filter supplied is of the washable type and should be reverse flushed with water and detergent. The thin, dry type filter element should be re-installed after washing and drying.

5-6. TROUBLE SHOOTING

5-7. The following illustrations are supplied to facilitate the operator in locating trouble within the equipment.

ILLUSTRATIONS

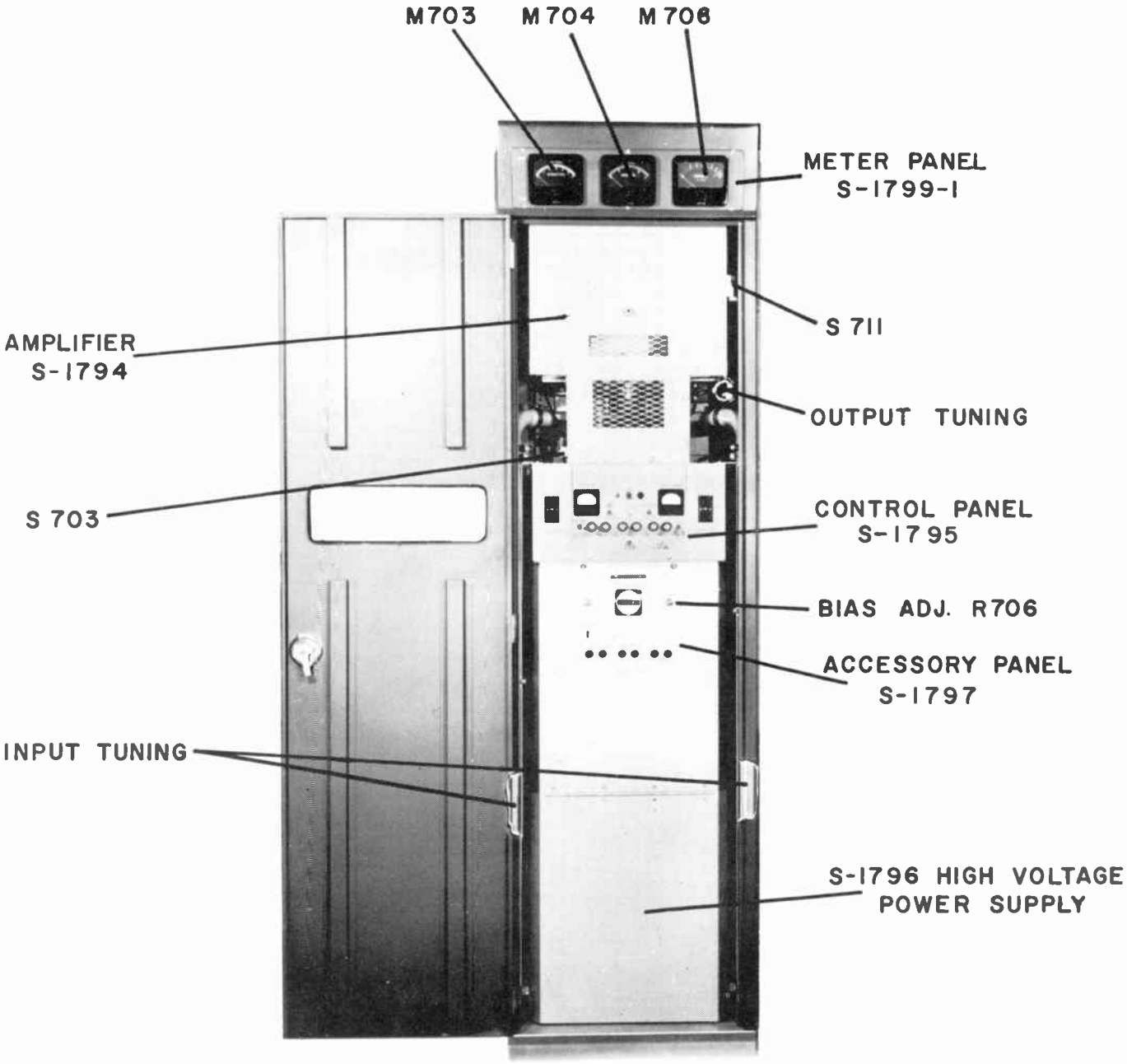


FIG. 5-1 TYPE 938 F.M. 5KW AMPLIFIER, FRONT VIEW

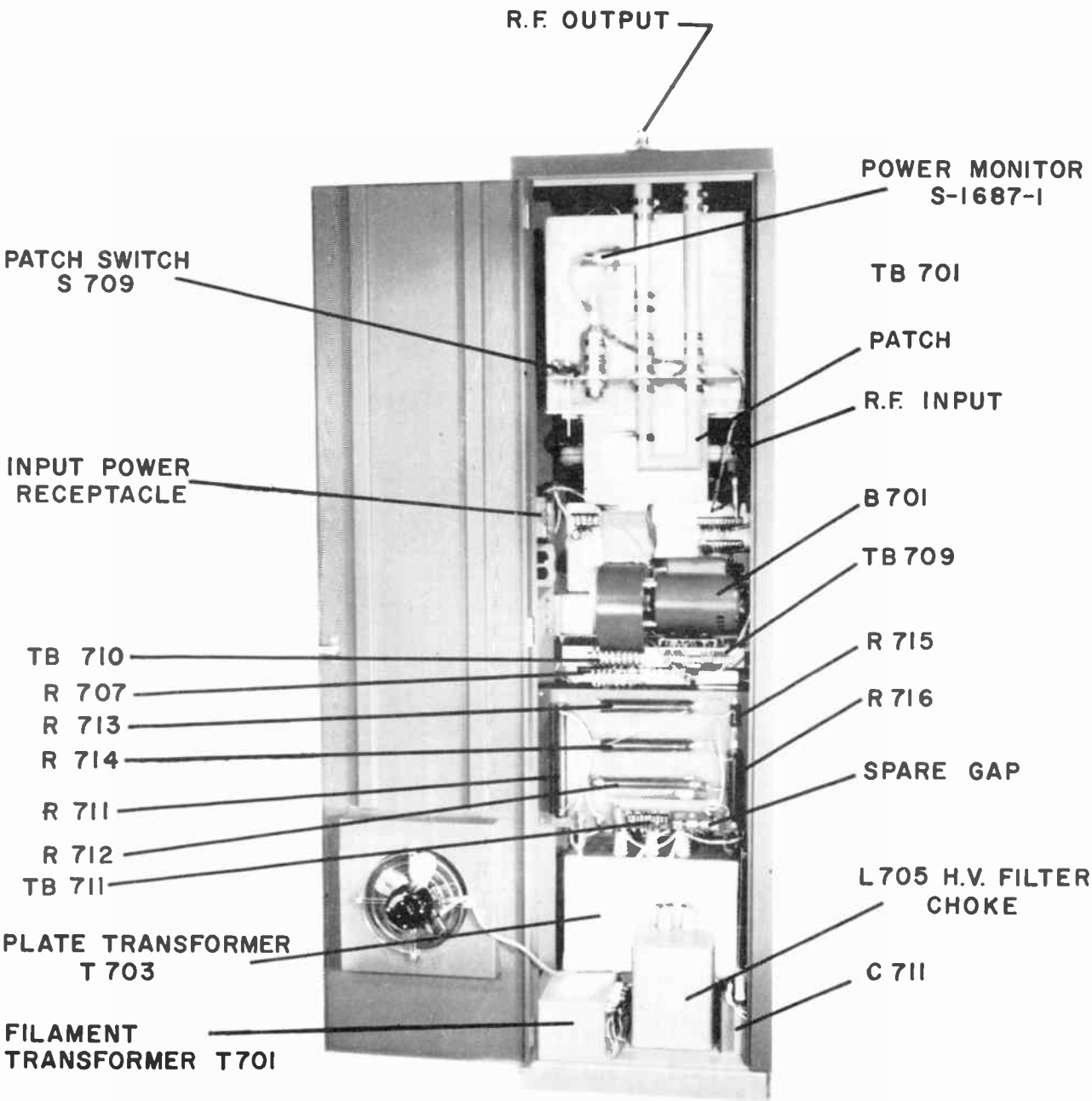


FIG. 5-2 TYPE 938 F.M. 5KW AMPLIFIER, REAR VIEW

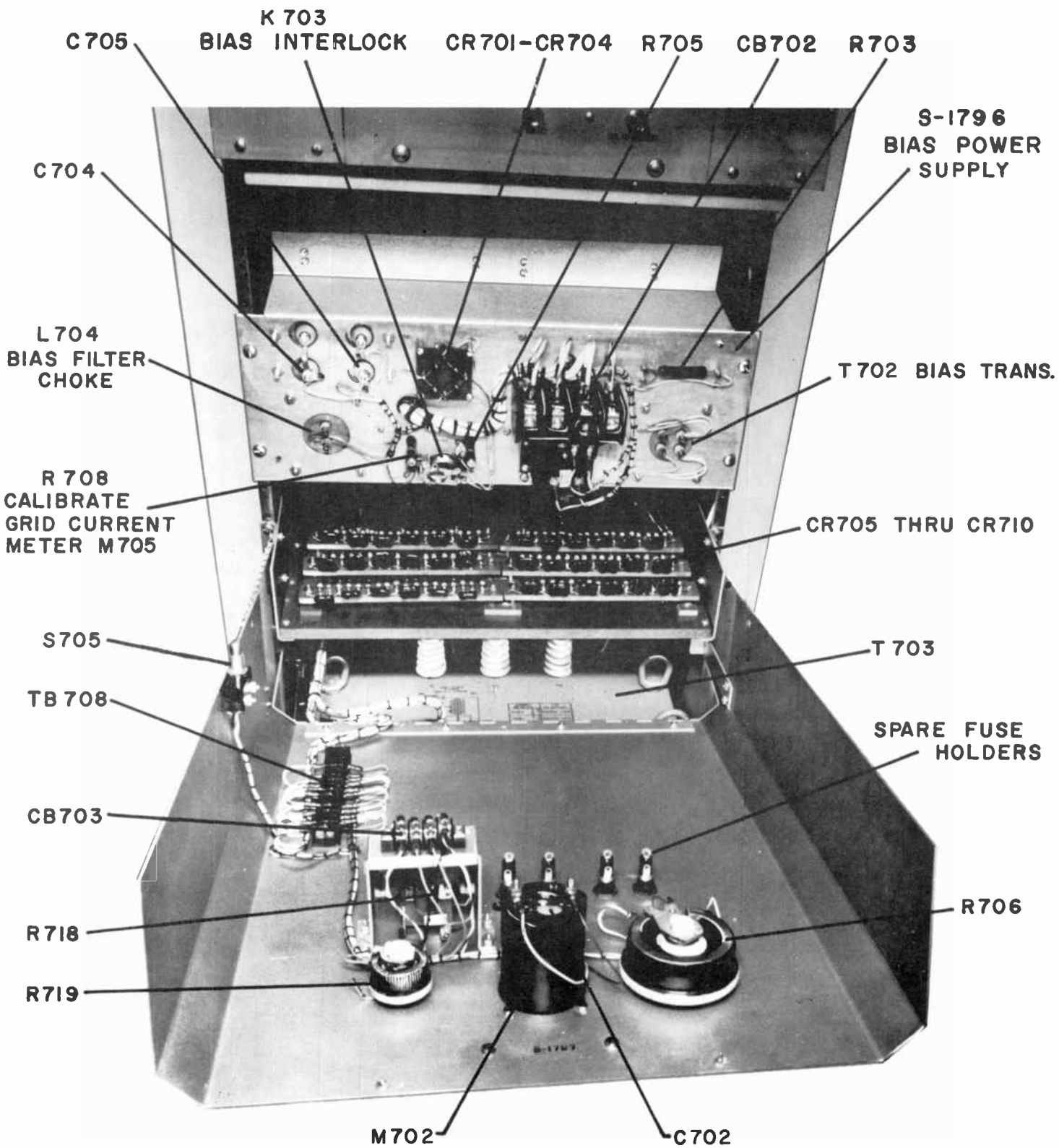


FIG. 5-3 TYPE 938 F.M. 5KW AMPLIFIER, ACCESSORY PANEL S-1797 LOWERED

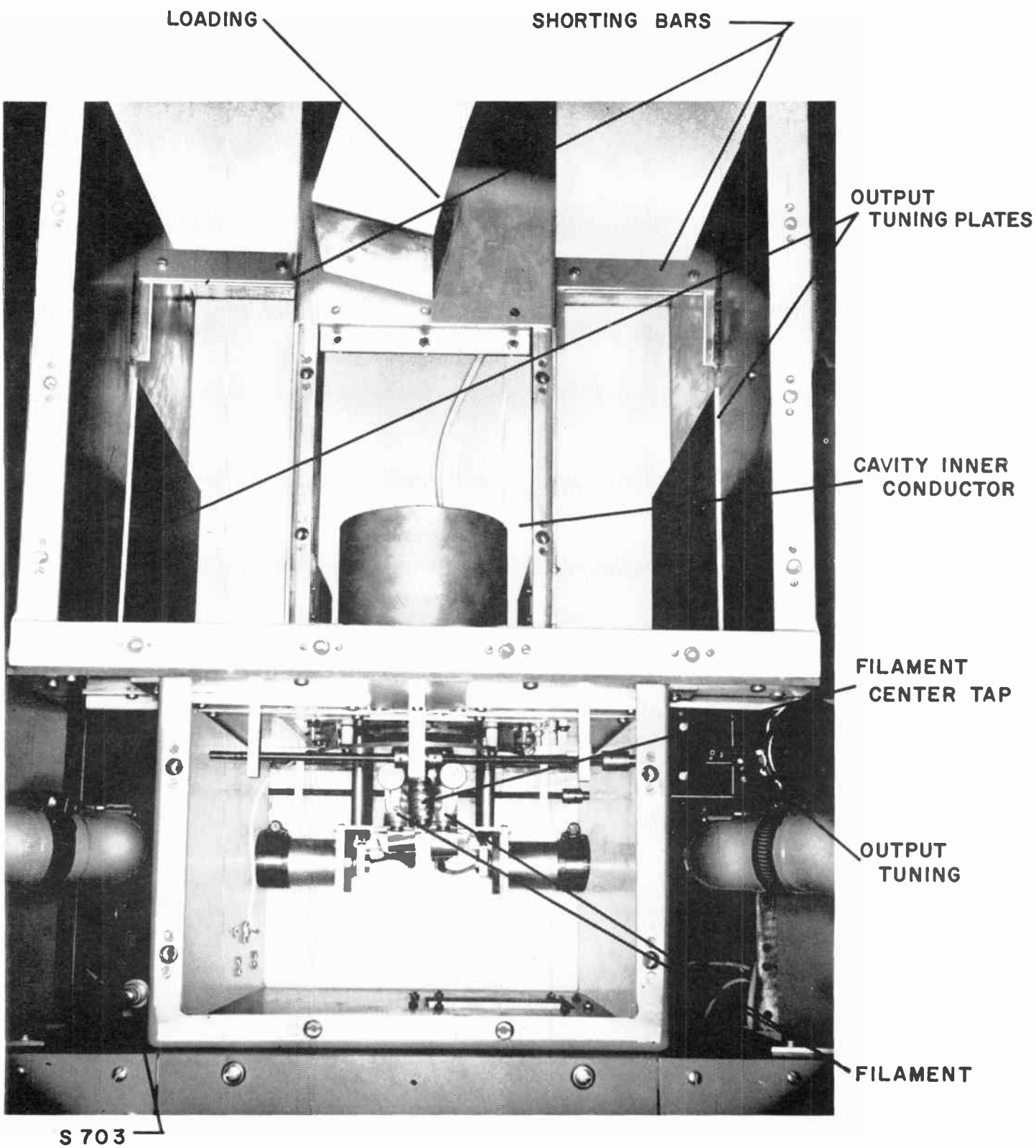
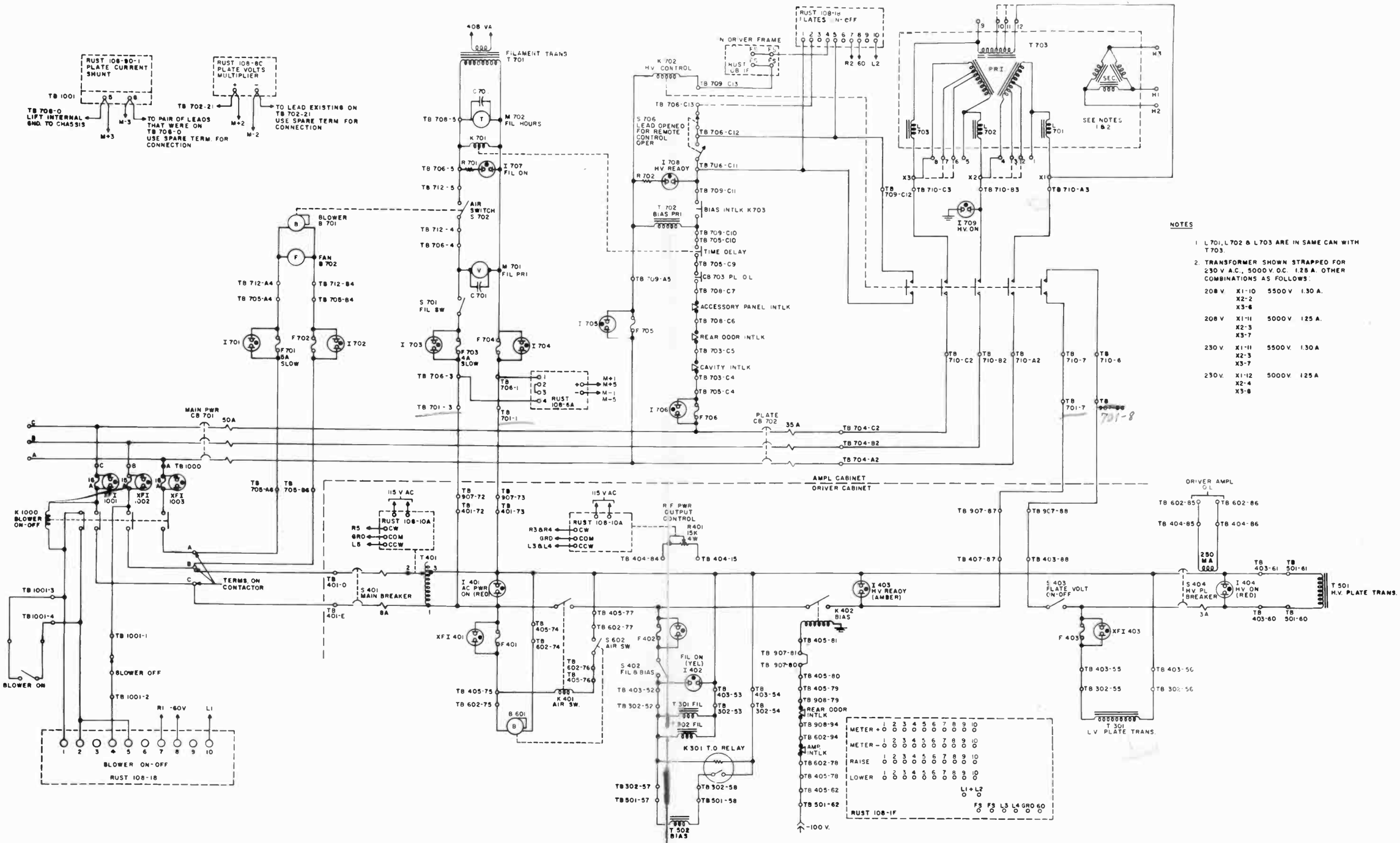


FIG. 5-4 TYPE 938 F.M. 5KW AMPLIFIER, CAVITY COVER OPENED

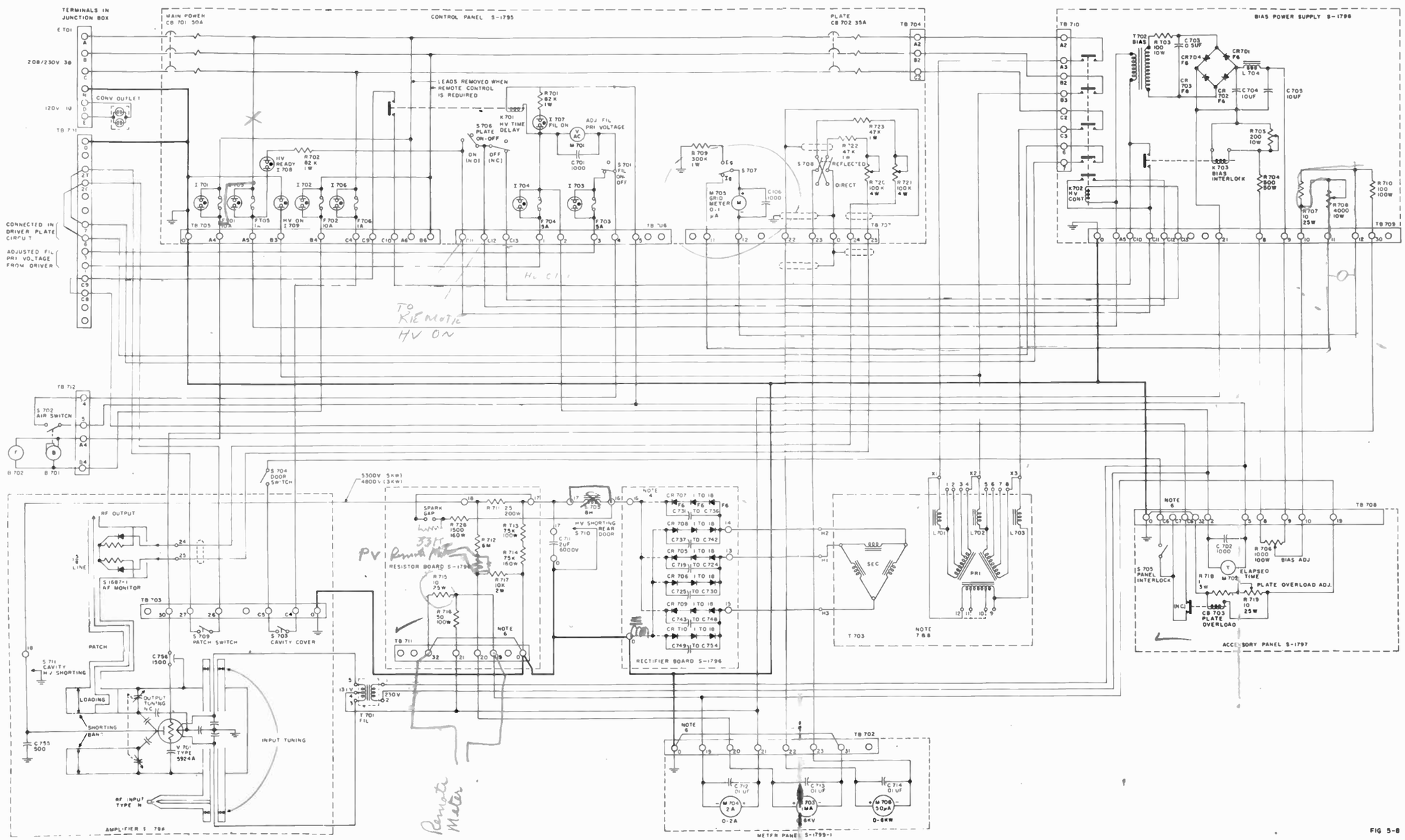


NOTES

1. L 701, L 702 & L 703 ARE IN SAME CAN WITH T 703.
2. TRANSFORMER SHOWN STRAPPED FOR 230 V A.C., 5000 V. D.C. 1.25 A. OTHER COMBINATIONS AS FOLLOWS:

208 V.	X1-10 X2-2 X3-6	5500 V	1.30 A.
208 V	X1-11 X2-3 X3-7	5000 V	1.25 A.
230 V.	X1-11 X2-3 X3-7	5500 V.	1.30 A
230 V.	X1-12 X2-4 X3-8	5000 V	1.25 A

FIG 5-6
ACROSS THE LINE WITH REMOTE CONTROL SCHEMATIC DIAGRAM TYPE 938 FM 5KW AMPLIFIER



NOTES

1- K=KILO=1,000 MEG=1,000,000 F=FARAD H=HENRY W=WATT M=MILLI=0.001 S=SECOND U=MICRO=0.000001

2- UNLESS OTHERWISE INDICATED
ALL RESISTANCE VALUES ARE IN OHMS 1/2 WATT
ALL CAPACITANCE VALUES ARE IN UUF
ALL INDUCTANCE VALUES ARE IN UH

3- DIRECTIONAL ARROW AT CONTROLS INDICATES CLOCKWISE ROTATION, VIEWED FROM SHAFT (KNOB) END

4- CR 705, 6, 7, 8, 9 & 10 DESIGNATES A SERIES STRING OF 18 SILICON DIODES, EACH GROUP OF THREE DIODES IS SHUNTED BY A CAPACITOR

5- TB 702 NOT INCLUDED ON EARLY UNITS

6- THESE JUMPERS ARE PROVIDED TO ACCOMODATE REMOTE METERING SHUNTS AND MULTIPLIERS WHEN THIS EQUIPMENT IS USED WITH A REMOTE CONTROL DEVISE, SEE SPECIFIC REMOTE CONTROL PANEL DRAWING FOR EXACT CONNECTIONS

7- L 701, L 702 & L 703 ARE IN SAME CAN WITH T 703

8- TRANSFORMER SHOWN STRAPPED FOR 230 V A.C., 5000 V D.C. 125 A. OTHER COMBINATIONS AS FOLLOWS:

208 V	X1-10 X2-2 X3-6	5500 V	130 A
208 V	X1-11 X2-3 X3-7	5000 V	125 A
230 V	X1-11 X2-3 X3-7	6500 V	130 A
230 V	X1-12 X2-4 X3-8	5000 V	125 A.

FIG 5-8 SCHEMATIC DIAGRAM TYPE 938 FM 5KW AMPLIFIER

SECTION 6

PARTS LIST

6-1. GENERAL

6-2. The following parts list are included in this section.

a.	Type S-1789-1	Cabinet
b.	Type S-1794	Amplifier
c.	Type S-1795	Control Panel
d.	Type S-1796	High Voltage Power Supply
e.	Type S-1798	Bias Power Supply
f.	Type S-1797	Accessory Panel
g.	Type S-1799-1	Meter Panel

A. Type S-1789-1 Cabinet

Type S-1789-1 Cabinet

Parts List

Reference Designation	Description	Mfr's. Type No. or REL Dwg. No.
B701	Blower:	ROTRON Model U, ccw, Type AS509
B702	Fan:	ROTRON Model BFG Type 3R
S702	Switch, Pressure:	ROTRON Model 2A Type 3000
S704	Switch, Sensitive:	MICRO SWITCH BZ-2RQ104
T701	Transformer, Power, Step Down: Primary 230 Volts 50/60 cps, Secondary 13.1 VCT at 33 amps.	S. E. DIV. - REL Spec. #37023 Dwg. #A-80993
1	Filter, Air Conditioning:	FARR CO. Type 44 - 13-½ x 13-½ x 1 in.

B. Type S-1794 Amplifier

Type S-1794 Amplifier

Parts List

Reference Designation	Description	Mfg'rs. Type No. or REL Dwg. No.
C755	Capacitor, Fixed, Ceramic Dielectric: 500 uuf, +50% -20% 20,000 V dcw; round molded case.	CENTRALAB Kit TV-207
C756	Capacitor, Fixed, Ceramic Dielectric: 1500 uuf, 2000 V dcw, feed thru type.	REL XC-PP-1232-OA
S703	Switch, Sensitive:	MICROSWITCH BZ-2RQ104
V701	Electron Tube:	AMPEREX 5924A
S709	Switch, Sensitive:	MICROSWITCH BZ-2RW2T

C. Type S-1795 Control Panel

Type S-1795 Control Panel

Parts List

Reference Designation	Description	Mfg'rs. Type No. or REL Dwg. No.
C701	Capacitor, Fixed, Mica Dielectric: 1000 uuf, ± 10%, 500 V dcw; wire-lead term. phenolic case.	ELMENCO RCM30B102K
C706	Capacitor, Fixed, Mica Dielectric: 1000 uuf, ± 10%, 500 V dcw	
CB701	Circuit Breaker: 3 pole, series trip, current rating 50 A @ 250 V 60 cps, curve 2, time delay; back connected.	HEINEMANN 3363S-50-250V 60 cps-2
CB702	Circuit Breaker: 3 pole, series trip; current rating 35A @ 250 V VAC, 60 cps, curve 3y time delay, back connected.	HEINEMANN 3363S-35-250V 60 cps - 3x
F701	Fuse, Cartridge: 10 amp at 250 V Ceramic body; 1-¼ in. lg. x ¼ in. dia. ferrule type term.	BUSSMANN ABC-10
F702	Fuse, Cartridge: 10 Amp @ 250 V	
F703	Fuse, Cartridge: 5 amp @ 250 V Ceramic body, 1¼ in. lg. x ¼ in. dia. ferrule type term.	BUSSMANN ABC-5
F704	Fuse, Cartridge: 5 amp @ 250 V	
F705	Fuse, Cartridge: 1 amp @ 250 V inst. glass body, 1¼ in. lg. x ¼ in. dia. ferrule type term.	BUSSMANN ABC-1
F706	Fuse, Cartridge: 1 amp @ 250 V	
I701	Part of XF701	
I702	Part of XF702	
I703	Part of XF703	
I704	Part of XF704	
I705	Part of XF705	
I706	Part of XF706	

Reference Designation	Description	Mfg'rs. Type No. or REL Dwg. No.
I707	Lamp, Glow: neon bulb; starting voltage 85 vac or 120 Vdc; T-3-¼ clear bulb; min. bayonet base.	G. E. NE-51H
I708	Lamp, Glow: neon bulb, 85 Vac, 120 Vdc.	G. E. NE-51H
I709	Lamp, Glow: neon bulb, 85 Vac, 120 Vdc.	G. E. NE-51H
K701	Relay, Solenoid: SPDT, 230 Vac, 60 cps, 45 sec. delay.	HEINEMANN ANI-522-XAX
M701	Voltmeter: flush panel mtg; 0-300 Vac; 2% f-s accuracy; rect. face cal for non-magnetic panel; four mtg. studs.	WESTINGHOUSE type RA33 Style 1204-030 0-300 VAC
M705	Ammeter: flush panel mtg. 0-1 ma dc movement; 0-300 scale w/o units 2% full scale accuracy; rect. face four mtg. studs.	WESTINGHOUSE type RX33 with 1 ma dc movement 0-300 scale w/o units
R701	Resistor, Fixed,Composition: 82,000 ohm ± 10% 1W	ALLEN BRADLEY GB-8231
R702	Resistor, Fixed, Composition: 82,000 ohm ± 10%, 1W	
R709	Resistor, Fixed, Film=300,000 ohm ± 1%, 1 watt	I.R.C. MDF-300,000-1%
R720	Resistor, Variable, Wirewound, 100,000 ohm, ± 10%, 4 watts, 1/8 in. lg. screw driver slotted shaft, bushing mtd.	CLAROSTAT 10C-2-100,000 ohm
R721	Resistor, Variable, Wirewound, 100,000 ohm, ± 10%, 4 watts	
R722	Resistor, Fixed, Film: 47,000 ohm, ± 10%, 1 watt	AEROVOX CP-1-47,000 ± 1%
R723	Resistor, Fixed, Film: 47,000 ohms, ± 10%, 1 watt	
S701	Switch, Toggle: SPST, rated 10A at 250 Vac, 15A at 125 Vac; bushing mtd. bat lever, screw term.	SPEMCO #1185

Reference Designation	Description	Mfg'rs. Type No. or REL Dwg. No.
S706	Switch, Toggle: momentary maintained neutral, 5 amp, 125 Vac, bat handle bushing mtg.	MICROSWITCH 13AT1
S707	Switch, Toggle: SPDT, 3 amps. at 125V, momentary contact; laminated body 3 solder-lug term. bushing mtd. bat handle	ARROW, HART & HEGEMAN 1167
S708	Switch, Toggle: DPDT, 3 Amps. at 250V: 6 amps at 125V; phenolic body 6 solder-lug term. bushing mtd. bat handle	A.H.&H. 81027CE
X1707	Light, Indicator: accommodates NE51H neon bulb; light yellow multi-vue cap, includes 18,000 ohm, resistor, u/w 1707	DIALCO 132-408H-996 w/light yellow cap
X1708	Light, Indicator: accommodates NE51H neon bulb, amber multi-vue cap, includes 18,000 ohm rest. u/w 1708	DIALCO 132-408H-993 w/amber cap
X1709	Light, Indicator: accommodates NE51H neon bulb, red multi-vue cap, includes 18,000 ohm resistor, u/w 1709	DIALCO 132-408H-991 w/red cap
XF701	Fuseholder: accommodated 1¼ in. lg. x ¼ in. o.d. ferrule type fuse, u/w F701	BUSSMAN HKL
XF702	Fuseholder: u/w F702	
XF703	Fuseholder: u/w F703	
XF704	Fuseholder: u/w F704	
XF705	Fuseholder: u/w F705	
XF706	Fuseholder: u/w F706	

D. Type S-1796 High Voltage Power Supply

Type S-1796 High Voltage Power Supply

Parts List

Reference Designation	Description	Mfg'rs. Type No. or REL Dwg. No.
C711	Capacitor, Fixed, Plastic Dielectric: 2 uf, 6000 V dcw	PLASTIC CAPACITORS OE-60-205
C719 thru C754	Capacitor, Fixed, Mica Dielectric: 1500 uuf, ± 10% 2500 V dcw. dip coated, silvered mica	ELMENCO VDM35E152K
CR705-1 to CR705-18	Semiconductor Device, Diode: 750 ma, 600 V piv, 420 V max. RMS, wire lead terminals	SARKES TARZIAN F6
CR706-1 to CR706-18	Semiconductor: Device, Diode: 750 ma, 600V, piv, 420V max. RMS, wire lead terminals	SARKES TARZIAN F6
CR707-1 to CR707-18	Semiconductor Device, Diode: 750 ma, 600V, piv, 420V max. RMS, wirelead terminals	SARKES TARZIAN F6
CR708-1 to CR708-18	Semiconductor, Device, Diode: 750 ma, 600V piv, 420V max. RMS, wire lead terminals	SARKES TARZIAN F6
CR709-1 to CR709-18	Semiconductor, Device, Diode: 750 ma, 600V, piv, 420V max. RMS, wire lead terminals	SARKES TARZIAN F6
CR710-1 to CR710-18	Semiconductor, Device, Diode: 750 ma, 600V piv, 420V max. RMS, wire lead terminals	SARKES TARZIAN F6
L705	Reactor: 8 Henry at 1.25 amp dc, 360 cps ripple, 12,000 Vrms test. DC Resistance 37Ω	S. E. Div. - REL Spec. #37326 Dwg. #A-81316
R711	Resistor, Fixed, Wirewound: 25 ohms, ± 5%, 200W	OHMITE 0901
R712	Resistor, Fixed, Wirewound: 6 MEG ohm, ± ½%, rated 1 ma. max., 6 KV	I. R. C. MFA 605-½%
R713	Resistor, Fixed, Wirewound: 75,000 ohm, ± 5%, 160W	OHMITE 0724

Reference	Description	Mfg'rs. Type No. or REL Dwg. No.
R715	Resistor, Fixed, Wirewound: 10 ohm, 25 W	OHMITE 0200B
R716	Resistor, Fixed, Wirewound: 50 ohm, ± 5%, 100W	OHMITE 0602
R717	Resistor, Fixed, Composition: 10,000 ohm, ± 10%, 2W	ALLEN BRADLEY HB1031
R728	Resistor, Fixed, Wirewound: ind. wdg. 1500 ohm, ± 5%, 160 watt tubular ceramic body, solder lug term. brkt. mtd.	WARD-LEONARD 160F-1500 w/815 mtg. brkt.
R729	Resistor, Fixed, Composition: 33,000 ohm, ± 10%, 2 watt, two axial wirelead term., term.mtg.	ALLEN BRADLEY HB-3331
T703	Transformer, Power, Step-up: includes L701, L702, L703	S. E. Div. - REL Spec. #37380 Dwg. #A-81402

E. Type S-1798 Bias Power Supply

Type S-1798 Bias Power Supply

Parts List

Reference Designation	Description	Mfg'rs. Type No. or REL Dwg. No.
C703	Capacitor, Fixed, Paper Dielectric: 0.5 uf, ± 20%, 600V dcw; tubular, h-s metal case	ASTRON MQCF-6-5
C704	Capacitor, Fixed, Paper Dielectric: 10 uf 600V dcw, rectangular h-s metal case, spade lug mtg. brkts.	CORNELL DUBILIER TJH-6100
C705	Capacitor, Fixed, Paper Dielectric: 10 uf 600V, dcw; rectangular h-s metal case, spade lug mtg. brkts.	CORNELL DUBILIER TJH=6100
CR701	Semiconductor Device, Diode: 750 MA, 600 piv, 420 V max. RMS Wire lead term.	SARKES TARZIAN F-6
CR702	Semiconductor, Device, Diode: 750 MA, 600 Piv, 420 V max RMS Wire lead term.	SARKES TARZIAN F-6
CR703	Semiconductor, Device, Diode: 750 MA, 600 Piv, 420 V max. RMS Wire lead term.	SARKES TARZIAN F-6
CR704	Semiconductor, Device, Diode: 750 MA, 600 piv, 420 V max. RMS Wire lead term.	SARKES TARZIAN F-5
K702	Relay, Solenoid: size 1, 3 pole, 208-230V, 60 cps, with normally open auxiliary contact, open frame	ALLEN BRADLEY 702BOA93 w/aux. cont. 895A1
K703	Relay, Armature: 12V coil, 96 ohm, dc resistance, SPST-NO-DB contacts rated 10 amp at 115 V-60 cps, resistive	POTTER & BRUMFIELD CA3D-12V coil
L704	Reactor: 8 Henry at 0.2 amp 71.5 ohms dc resistance, 3000 V rms, test	S. E. DIV. - REL Spec. #37309
R703	Resistor, Fixed, Wirewound: 100 ohm, 10W, terminal mounted.	OHMITE 1-3/4-D-54-F 100 ohm
R704	Resistor, Fixed, Wirewound: 500 ohm ± 5%, 50W, bracket mtd.	OHMITE 0402

Reference Designation	Description	Mfg'rs. Type No. or REL Dwg. No.
R705	Resistor, Adjustable: wirewound, 200 ohm, ± 5%, 10W	OHMITE 1014-N05
R707	Resistor, Fixed Wirewound: 10 ohm, 25W	OHMITE 0200B
R708	Resistor, Adjustable: Wirewound, 4000 ohms, 10W	OHMITE 1031
R710	Resistor, Fixed, Wirewound: 100 ohm, 100W	OHMITE 0604
T702	Transformer, Power, Step-up: Primary 230 Volts 60 cps., Secondary 312 Volts at 348 MA.	S. E. DIV. - REL Spec. #37327

F. Type S-1797 Accessory Panel

Type S-1797 Accessory Panel

Parts List

Reference Designation	Description	Mfg'rs. Type No. or REL Dwg. No.
C702	Capacitor, Fixed, Ceramic Dielectric: 0.01 uf, GMV, 600 V, disc.	R.M.C. B-0.01-600 V
CB703	Relay, Armature: overload type; trip indicator, SPST normally closed contacts rated 1½ amp at 250 VAC, instantaneous trip, must hold 0.5 amp, must trip at 0.625 amp. max. volt 3.2 VDC, for panel mounting.	HEINEMANN PCR1-617-XXA
M702	Meter, Time Totalizing: registers up to 99,999.9 hours, non-reset, 240V-60 cps, 2½ in. sq. case.	G. E. 8KT11BBA2
R706	Resistor, Variable, Wirewound: 1000 ohms, ± 10%, 100 watt, slotted shaft, shaft locking.	OHMITE K-1000-Lo-2
R718	Resistor, Fixed, Wirewound: one ohm, ± 5%, 3W	OHMITE 7/16-A-54-F-1 ohm
R719	Resistor, Variable, Wirewound: 10 ohms, ± 10%, 25 watt, slotted shaft, shaft locking	OHMITE H-10-LO-2
S705	Switch, Sensitive: SPDT, rated 15 amp at 125 V; 10 amp at 250 VAC plunger actuator	MICRO SWITCH BZ-2RQ104

G. Type S-1799-1 Meter Panel