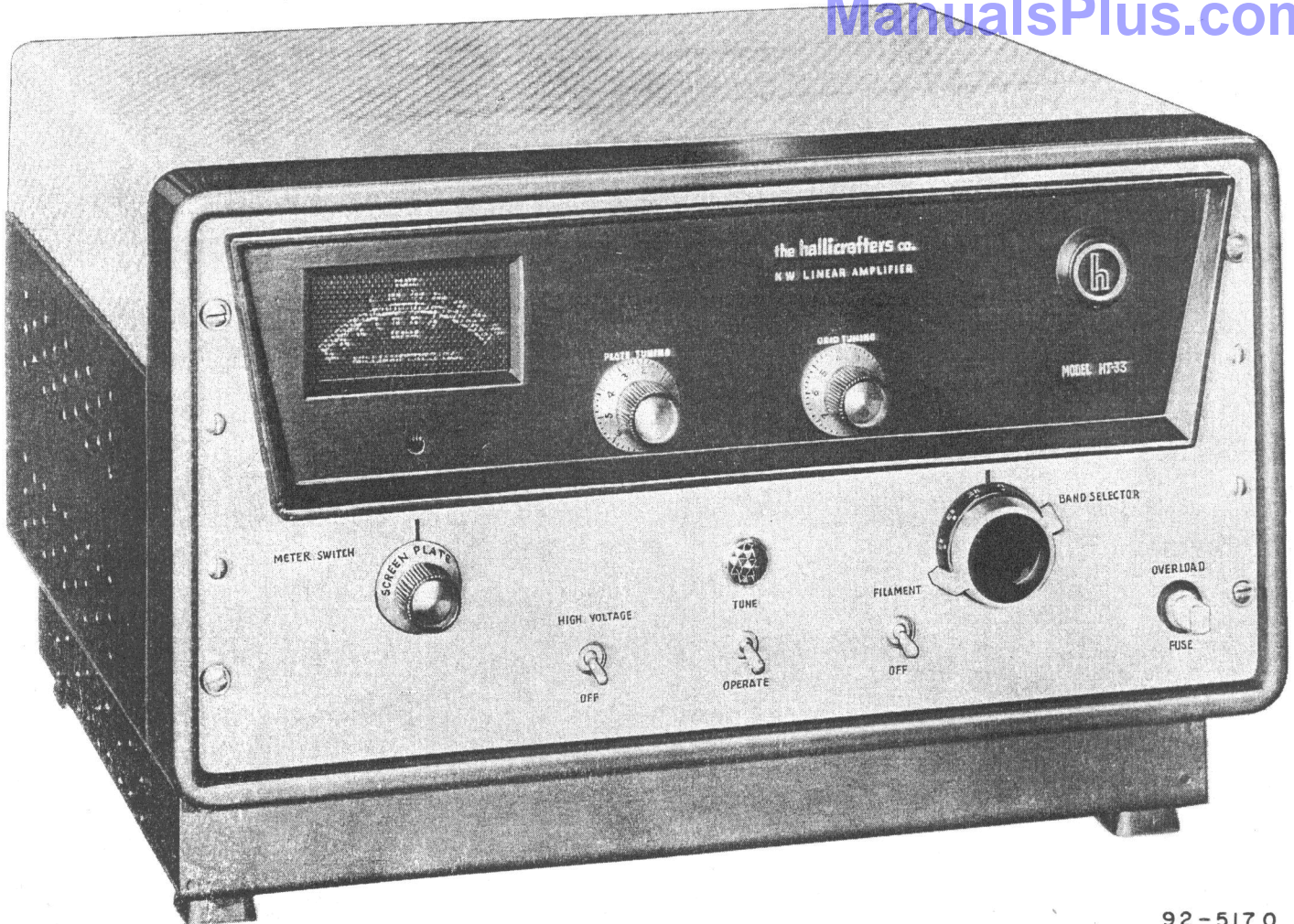


**MODEL HT-33 MARK I
LINEAR AMPLIFIER**

the hallicrafters co.

MANUFACTURERS OF RADIO, TELEVISION, AND ELECTRONIC EQUIPMENT, CHICAGO 24, U. S. A.



92-5170

Figure 1. Photograph HT-33 Linear Power Amplifier

SECTION I GENERAL DESCRIPTION

1-1. The Hallicrafters Model HT-33 is a precision built, ultra compact one thousand watt linear amplifier, employing two 4CX300A long life, extra rugged, ceramic tetrodes operating Class AB1. This mode of operation gives the maximum in efficiency along with a minimum of distortion and extremely modest drive requirements. This unit has been engineered to provide highly efficient operation when used in conjunction with Hallicrafter's Model HT-30 or HT-32 (with suitable pad) SSB exciters. Other exciter units may be employed if they are capable of delivering sufficient output power to utilize the full capabilities of the HT-33. The exciter should also be capable of approaching the high performance standards of the Hallicrafters HT-30 or HT-32 as applied to signal quality and stability. The nominal power output will be 625 watts P.E.P. with 8 watts P.E.P. drive on all bands with all distortion products down better than 30 D. B.

The circuit employs two 4CX300A ceramic tetrodes in parallel. The completely self contained power supply uses two 866A's connected in a full wave rectifier circuit with excellent regulation. Screen voltage is controlled by VR tubes. A variable bias supply is also included to maintain proper idling plate current. Pro-

vision has been made to apply full cut-off bias to the amplifier tubes by de-energizing the 6.3V AC bias relay which is terminated at terminal strip TS-1 on the rear of the chassis. Connection should be made through a set of contacts on an external antenna change-over relay and connected between pin 1 and 4 of TS-1.

Overload protection is provided by separate fuses, a 5 amp. fuse for all filaments, bias supply, blower and base fan, and a 15 amp. fuse in the primary of the plate supply transformer. The 15 amp. fuse is in an indicator type fuseholder located on the front panel. Should this fuse blow, the fuse holder cap will glow a bright orange color. An interlock safety switch removes the primary voltage from the plate supply transformer when the cabinet cover is open. (Do not attempt to defeat its purpose as lethal voltages will be present). A fixed Pi network is incorporated, giving 50 ohm output on all bands. Under no circumstance should this unit be fed into an unmatched reactive load. All amateur bands 80 through 10 meters are easily tuned without the use of plug in coils.

1-2. TVI SUPPRESSION.

Every consideration has been given to possible local TVI problems in the design of the HT-33. Circuitry has been used that discourages harmonic generation. A low pass filter has been included in series with the AC power leads. The enclosed metal cabinet greatly aids in shielding. A screen has been provided over the meter opening.

1-3. ADDITIONAL FEATURES.

Many additional features have been included for reli-

ability and ease of operation. Bridge neutralization is used to insure stable operation on all bands. Screen and cathode current are easily read on a large dual scale illuminated meter. Meter switching is accomplished by a two position selector switch on the front panel. The entire unit is power ventilated by means of a built in blower and base fan to insure adequate cooling under all operating conditions. A red jewel indicator is used to indicate that primary voltage is applied to the plate supply transformer. All bandswitching is accomplished by a single selector knob.

SECTION II INSTALLATION

2-1. Unpacking. Check all shipping tags and labels for further instructions before removing or destroying. Check to see that base fan blades turn freely.

Location. The HT-33 should be located reasonably close to the exciter unit.

It is very important that the HT-33 be placed in such a manner that complete air circulation will be had on all sides as well as top and bottom. Under no circumstance should any object be placed on top of this unit.

2-2. Power Source Requirements. The HT-33 is designed for 117 volt 60 cycle AC operation. The source should be capable of supplying 1450 watts with good regulation at the specified operating voltage.

2-3. Rack Mounting. Removal from Cabinet.

If rack mounting is desired, the unit must be removed from the cabinet.

Step #1. Remove one screw from interlock switch bracket and swing switch and bracket into horizontal position.

Step #2. Remove air scoop from blower. This is held in place by three sheet metal screws around blower intake opening.

Step #3. Remove upper and lower panel screws on each side of front panel.

Step #4. Remove five chassis mounting bolts at bottom rear of cabinet.

Step #5. Remove base fan plug.

Step #6. Slide chassis forward from cabinet.

The slots at the edges of the front panel are properly spaced to accommodate mounting screws in a standard 19 inch rack.

The blower air scoop should be replaced if rack mounting is used to prevent recirculation of warm air from the amplifier tubes.

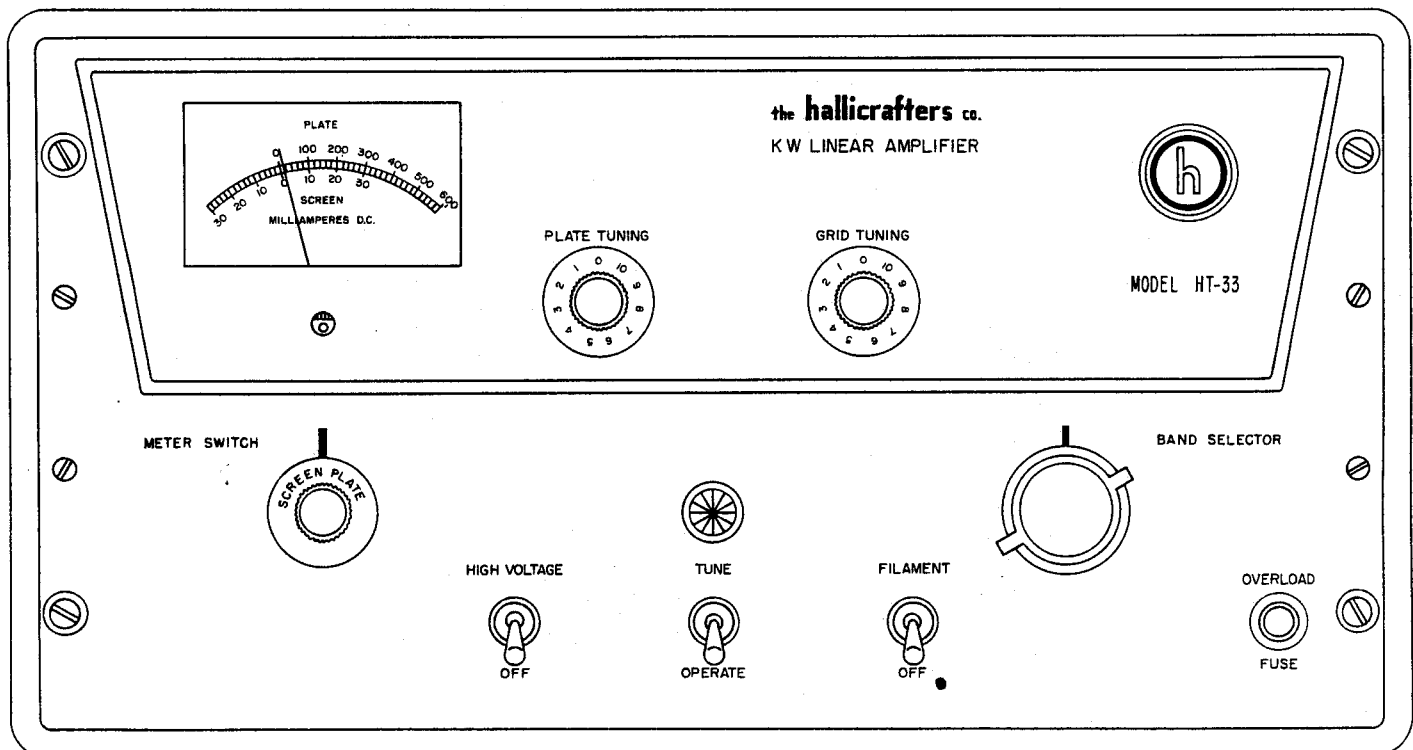


Figure 2. Front Panel View

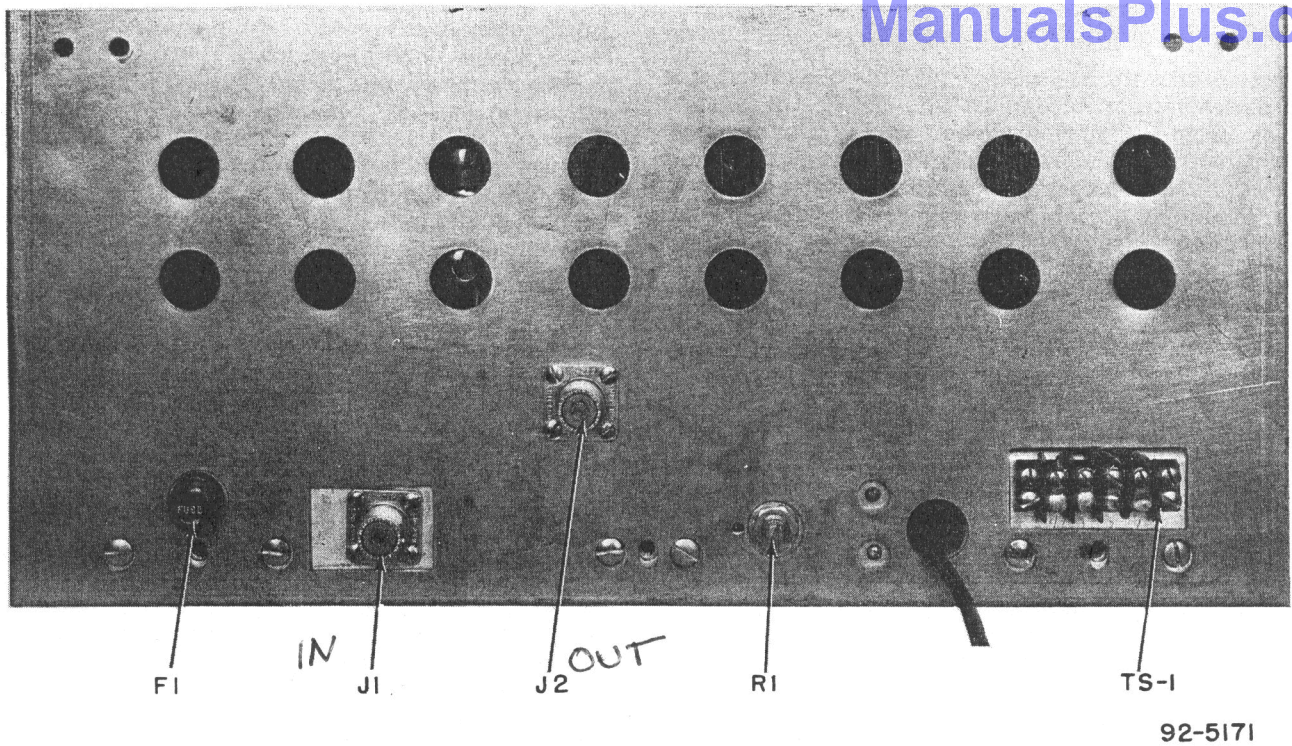


Figure 3. Chassis-Rear View

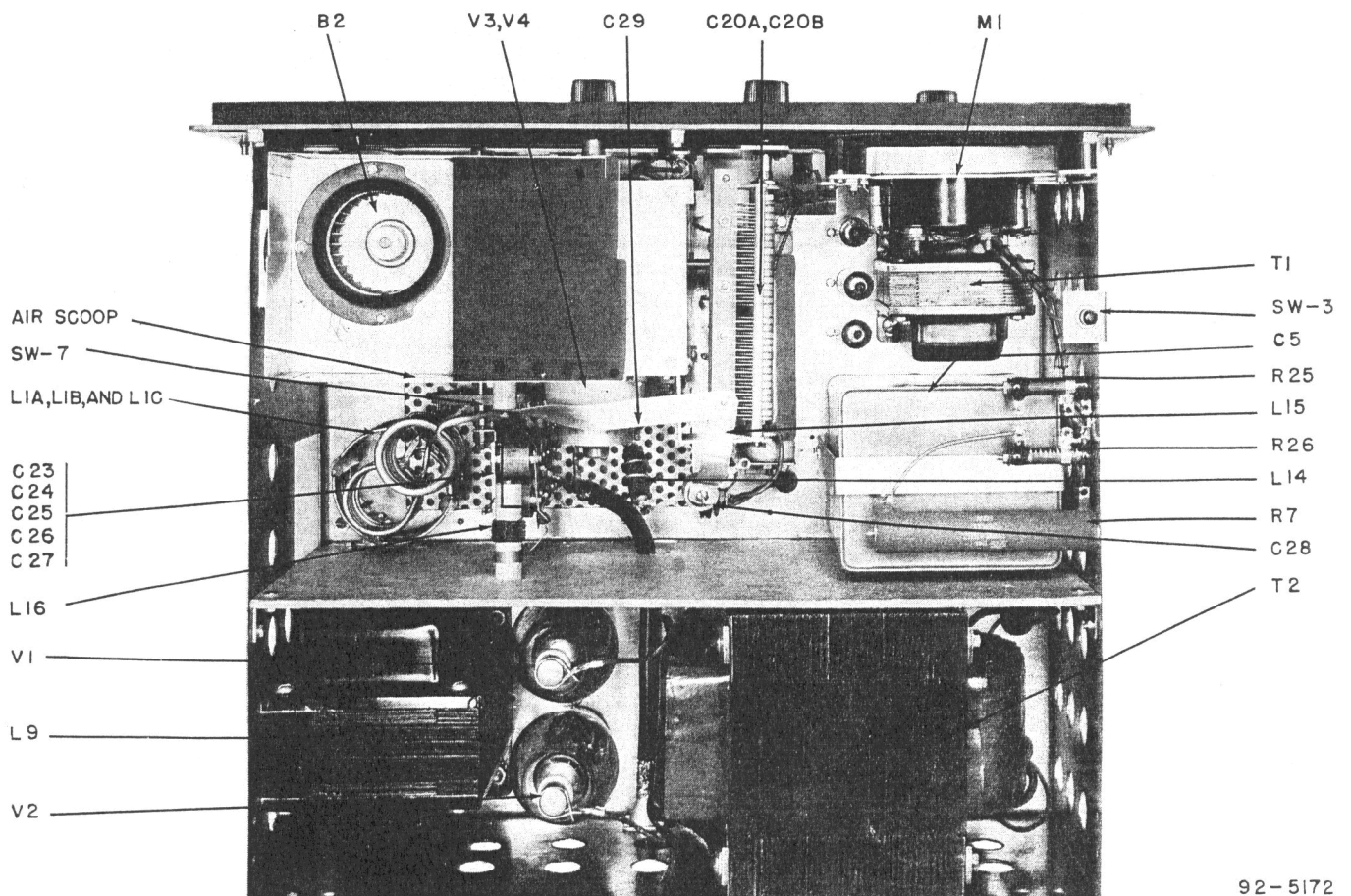


Figure 4. Chassis-Top View

SECTION III CONTROLS

3-1. Function and use of operating controls. See Figure 2.

Name of Control	Type	Function and Use
Filament Sw.	Toggle (S. P. S. T.)	Connected in series with power line. Used to energize filament, bias, fan, and blower circuits or to disable entire unit.
High Voltage Sw.	Toggle (S. P. S. T.)	Used to energize relay in primary of plate supply transformer.
Meter Sw.	Rotary (2 position)	Connects the meter to read screen current or cathode current. Separate meter scales are provided for screen and cathode readings. The setting of the switch automatically switches in the shunt for reading Cathode current.
Band Selector	Ganged Rotary (5 position)	Selects correct grid and plate coils for each band and switches in correct capacity in Pi network. Also switches in additional stator section of plate tank condenser on 80 meters.
Tune Sw.	Toggle (S. P. S. T.)	Reduces power output during tune up by switching in 100 ohm resistor in cathode circuit thus increasing bias on the tubes.
Grid Tuning	Variable Capacitor	Resonates the grid circuit. Used in conjunction with the exciter output adjustments to load the grid circuit.
Plate Tuning	Variable Capacitor (Split Stator)	Resonates the plate circuit. One section used for 40-20-15-11-10 meters, both sections are used in parallel for 80 meter operation.

3-2. Input Connector. The input connector, located on the rear of the chassis, will mate with an Amphenol type 83-1SP coax connector (not supplied with amplifier). Excitation from the exciter unit should be applied through this connector. The input is designed to be fed from a 50 ohm unbalanced line with very low V.S.W.R.

Caution. Input drive should never be allowed to exceed 20 watts P.E.P. or serious damage will result to the input circuit. It should be remembered that 8

watts P.E.P. will drive this unit to the legal limit. Even less excitation is required for A.M. and C.W.

Do not operate as linear amplifier with switch in "Tune" position as the linearity will be affected.

3-3. Output Connector. The output connector, located on the rear of the chassis will mate with an Amphenol type 83-ISP coax connector (not supplied). The amplifier is designed to work into a 50 ohm Non-reactive load.

SECTION IV TUNING

4-1. General. The general tuning procedure's are similar to those for any power amplifier. Additional considerations are necessary, however, to insure linear operation and to prevent overloading during tune up procedure. A mismatched load or excessive excitation may result in non-linearity and consequently a high distortion product level being radiated. Initial tuning should be made at the desired frequency using C.W. excitation. Final adjustments for other types of operation will then be simplified. A description of the function of the operating controls is given in Section III. Also refer to Figure 2. Tuning procedures for C.W., S.S.B. and A.M. operation are as follows:

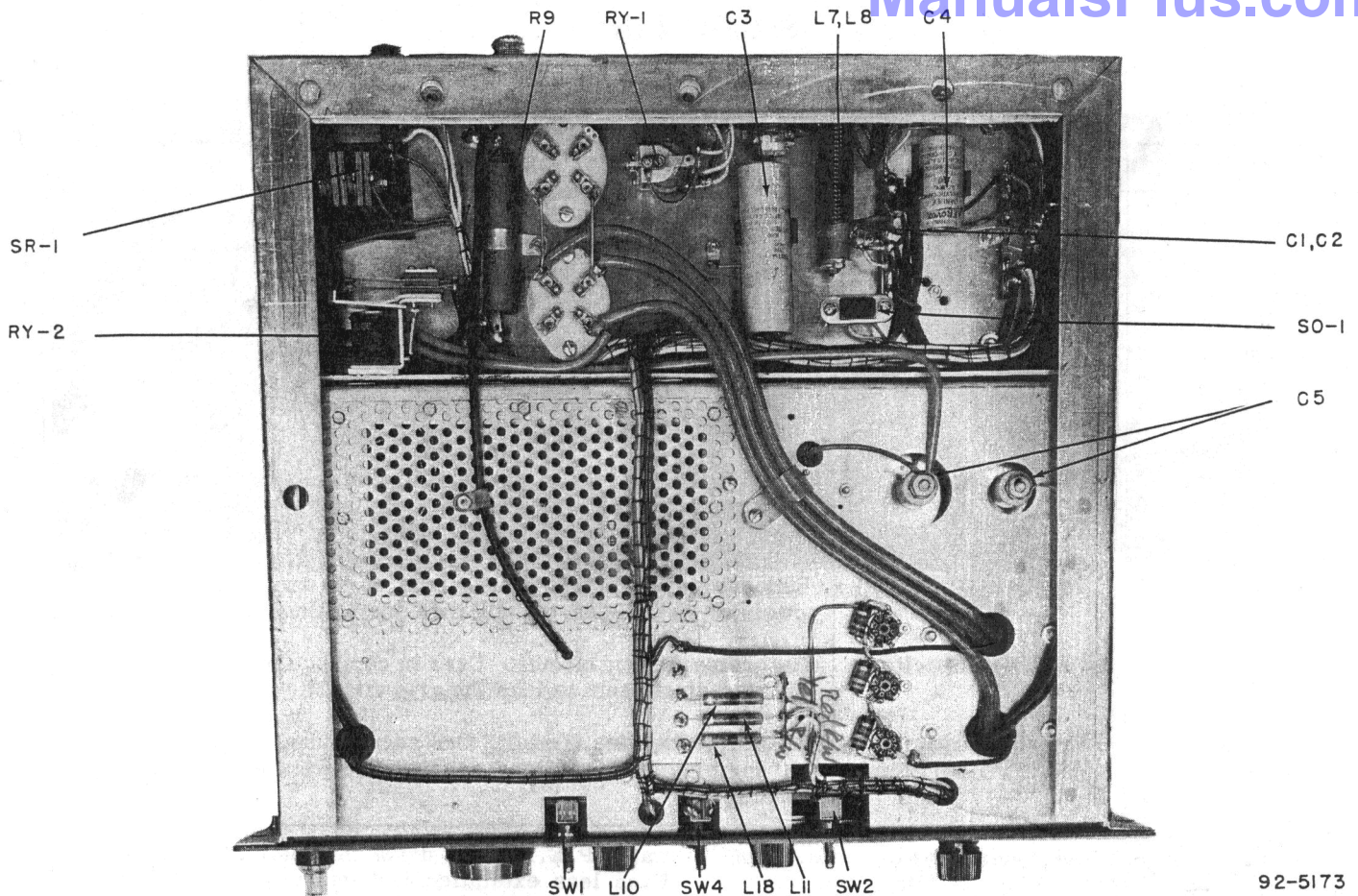
4-2. TUNING PROCEDURE - GENERAL.

The following steps apply to all types of operation.

1. Set "Filament" switch in "OFF" position.
2. Set "High Voltage" switch in "OFF" position.

3. Set "Tune" switch in "Tune" position.
4. Set "Meter" switch in "Plate" position.
5. Set "Band Selector" switch to desired band.
6. Connect 50 ohm load to "Output" coax receptacle.
7. Connect exciter output coax to "Input" coax receptacle.
8. Plug HT-33 A.C. line cord into receptacle capable of delivering a minimum of 1450 watts at 117 volts, 60 cycles.
9. Place "Filament" switch in "ON" position and allow a 10 minute warm up period.

(Note. Blower and base fan should always be in operation when "Filament" switch is on. High voltage should never be applied if either is inoperative.)



92-5173

Figure 5. Chassis-Bottom View

4-3. TUNE UP FOR C.W. OPERATION.

1. Place "High Voltage" switch in "ON" position.
2. Carefully apply a small amount of C.W. excitation (approx. 2 watts P.E.P.) and resonate grid circuit of HT-33 by observing increase in meter current.
3. Resonate plate circuit by tuning "Plate Tuning" condenser for minimum plate current.
4. Place "Tune" switch in "Operate" position.
5. Carefully increase excitation to desired input.

Note. 500 ma. will give one Kilowatt input and is the absolute maximum (2000 Volts X 500 Ma.).

4-4. TUNE UP FOR SSB OPERATION.

1. Proceed as described for C.W. operation.
2. Remove C.W. excitation.
3. Place exciter in S.S.B. position, and gradually

increase gain control while speaking into microphone until voice peaks show tendency to flatten, as viewed on oscilloscope connected across 50 ohm output. Decrease exciter gain control slightly until voice peaks no longer show any tendency to flatten.

Caution. Do not use meter as voice peak indicator as the meter does not follow the speech plate current swing and therefore in no way indicates true peak power on S.S.B.

Without excitation, idling plate current will normally run between 200-300 ma. for S.S.B. and D.S.B. (See specifications for C.W. operation.)

4-5. TUNE UP FOR DOUBLE SIDE BAND WITH CARRIER. (A.M.)

1. Proceed as described for C.W. operation.
2. Remove C.W. excitation.
3. Place exciter in D.S.B. position and gradually increase excitation until voice peaks show tendency to flatten as viewed on an oscilloscope connected across 50 ohm output. Back off excitation slightly

until voice peaks no longer show any tendency to flatten.

Caution. Any transmitter is subject to spurious radiation if improperly tuned or if the modulation limits are exceeded. Continuous monitoring of the output by means of an oscilloscope is an excellent method of insuring compliance with FCC regulations. This is true both for S.S.B. and D.S.B. operation. For test checks, the "Two-Tone Test" method is highly recommended. Consult "Single Side Band For The Radio Amateur", an A.R.R.L. publication for complete information. (Single tone for D.S.B. with carrier.)

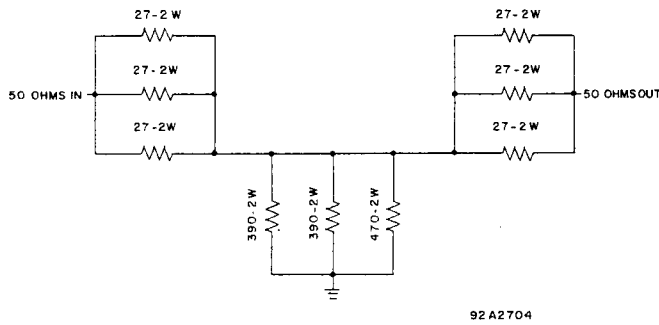


Figure 6. HT-30 50 ohm Pad

* A 3DB pad is recommended for use between a HT-30 SSB exciter and the HT-33. The pad may be conveniently wired in a metal box (6" x 2" x 2") with a removable cover. Amphenol SO-239 receptacles should be installed at each end.

4-6. **Note.** Some types of SSB exciter units may be optimistically or incompletely rated with respect to their output capabilities. In order to obtain the stability necessary to properly drive a high power linear amplifier, it may be necessary to provide swamping of a portion of the exciter output signal in the coupling between the exciter output and the HT-33 input. As much swamping should be used as possible as this will improve the dynamic stability of the exciter. Also, swamping will improve carrier suppression and unwanted side band figures as these are rated at full exciter output. Be sure that the exciter is linear at the chosen operating level.

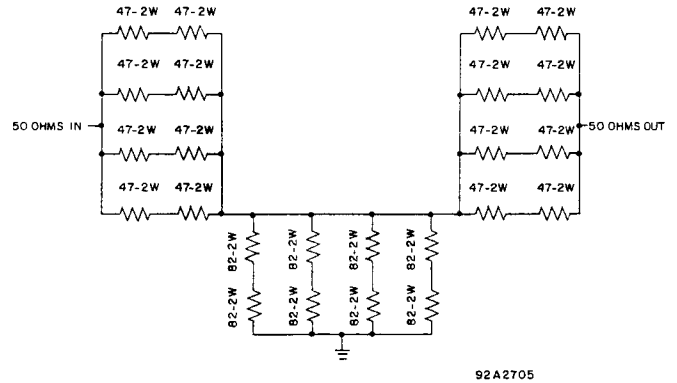
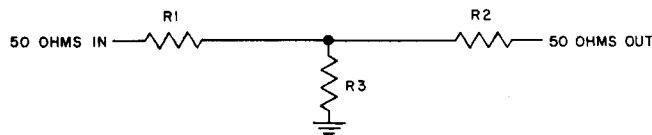


Figure 7. HT-32 50 ohm Pad

** A 9 DB pad is recommended for use between a HT-32 SSB exciter and the HT-33. The pad may be conveniently wired in a metal box (8" x 3" x 3") with a removable cover. Amphenol SO-239 receptacles should be installed at each end.

Typical values for a 50 ohm pad are as follows;



Attenuation	R1-Ohms	R2-Ohms	R3-Ohms	Power Loss
2 DB	6	6	215	36%
* 3 DB	9	9	142	50%
5 DB	14	14	82	66%
7 DB	19	19	56	80%
** 9 DB	24	24	41	87.5%

Note. Nearest standard RETMA value may be used. Use only non-inductive resistors.

Note. These pads are suitable for SSB, radio-telegraph, and AM operation, however, steady full level C. W. excitation should be avoided except for very brief test periods as the dissipation rating of the resistors will be exceeded.

SECTION V

SERVICE OR OPERATING QUESTIONS

5-1. For further information regarding operation or servicing of any Hallicrafters equipment, contact your Hallicrafters dealer. The Hallicrafters Company maintains an extensive system of Authorized Service Centers where any required service will be performed promptly and efficiently at a nominal charge. All Hallicrafters Authorized Service Centers display the sign shown at the right. For the location of the one nearest you, consult your dealer or telephone directory. Make no service shipments to the factory as the Hallicrafters Company will not accept the responsibility for unauthorized shipments.

The Hallicrafters Company reserves the privilege of making revisions in current production of equipment and assumes no obligation to incorporate these revisions in earlier models.



92X1401-C

SECTION VI

GENERAL SPECIFICATIONS

Dimensions, overall.. 20" w X 12 3/8" h X 17 1/8" d.
 Dimensions, front panel 8 3/4" h X 19" w.
 Mode of operation Class AB1 linear power amplifier
 Power Consumption 1450 watts @ 117 volts, 60 cycles A.C.
 Plate power input-S.S.B. 1000 watts P.E.P.
 Plate power input-D.S.B. (A.M.)..... 775 watts
 Plate power input-C.W. *1000 watts
 Power Output-S.S.B..... 625 watts P.E.P.
 Drive Power-S.S.B. 8 watts P.E.P.
 Drive Power-D.S.B. (A.M.)..... 6 watts
 Drive Power-C.W..... 6.5 watts
 Weight, net.....123 lbs.
 Weight, shipping129.5 lbs.

*Efficiency may be increased on C.W. by reducing idling plate current to 100 ma.

Normal idling plate current for S.S.B. and D.S.B. (A.M.) will be 280 ma. unless otherwise specified on shipping tag. Idling plate current should not be allowed to exceed 300 ma as tubes plate dissipation is 600 w = 2000 v X 300 ma. This is controlled by bias adjustment on rear of chassis.

6-1. SCREEN CURRENT.

Screen current will vary from band to band and under different conditions of loading. A special meter scale has been provided to read this current and the proper range will be selected by placing the meter switch in "Screen" position. It is entirely normal for the screen current to read "0" or even negative in operation.

5-2. WARNING - HIGH VOLTAGE.

D.C. voltage in excess of 2000 volts and A.C. voltage in excess of 4000 volts is present in this equipment.

Do not attempt to measure voltages with hand held test leads nor attempt to service this unit with the plate supply on. In addition to the danger of serious injury or death from the high voltage supply, serious radio frequency burns can be caused by coming in contact with, or close proximity to the plate and output circuits.

An A.C. interlock is installed on the cover for your protection. Do not attempt to defeat its purpose. Also, a bleeder circuit is provided to discharge the high voltage filter condenser. However, we strongly recommend the use of a grounding rod to short the high voltage circuit to the chassis before any servicing is attempted. **USE EXTREME CAUTION IN WORKING WITH THIS EQUIPMENT.**

Meter readings from -15 ma. to +15 ma. are to be considered normal.

6-2. NEUTRALIZATION.

This unit has been carefully neutralized at the factory and no further adjustment will be necessary except as a result of repair procedures. Improper neutralization will be indicated if maximum power output does not coincide with minimum plate current as the "Plate Tuning" condenser is tuned through resonance.

The following procedure is recommended if any adjustment is found necessary.

1. Follow tuning procedure as described under C.W. operation on 10 meters.
2. Set "High Voltage" switch to "OFF" position.
3. Short 4CX300A plate cap to chassis with grounding rod (Remove after 30 seconds).
4. Disconnect 50 ohm load from output.
5. Connect sensitive null indicator across 50 ohm output circuit.
6. Apply C.W. excitation (HIGH VOLTAGE OFF) until reading is indicated on null indicator.

Note. Do not exceed 20 watts P.E.P. input.

7. Adjust "Neutralizing Tab" by bending slightly toward or away from 4CX300A plate connector

assembly until minimum reading is obtained.

Note. Maintain at least one quarter inch spacing between tab and plate connector assembly to prevent arcing.

8. Remove excitation.
9. Remove null indicator and connect 50 ohm load.

6-3. CLEANING.

Equipment that is continuously power ventilated may tend to collect dust within the unit depending upon the content of the air being circulated. The circuitry should be kept clean as any accumulation of dust in the high voltage or R.F. areas may cause arcing and consequent damage. This applies to both the top side and underside of the chassis.

The preferred method of cleaning is the use of a vacuum cleaner while dusting with a clean brush. Do not use solvents for cleaning.

6-4. LUBRICATION.

The blower will require one or two drops of oil in each of the oilers approximately once every six months under normal use. Any good grade of household oil may be used. The oilers are located at top and bottom of blower motor housing on side facing the plate tank coils.

6-5. 4CX300A TUBE REPLACEMENT (Caution - High Voltage)

Special provisions have been made for equalization of the load on the two parallel operated tubes, thus increasing tube life and output power.

Should tube replacement be found necessary, the following steps are recommended.

Note. No excitation is to be used during any of following steps. The load should be connected to the 50 ohm output.

1. Remove the defective tube from socket and install remaining tube in upper socket. (No tube in lower socket.)
2. Adjust bias control on rear of chassis until "Plate" reads 500 MA.

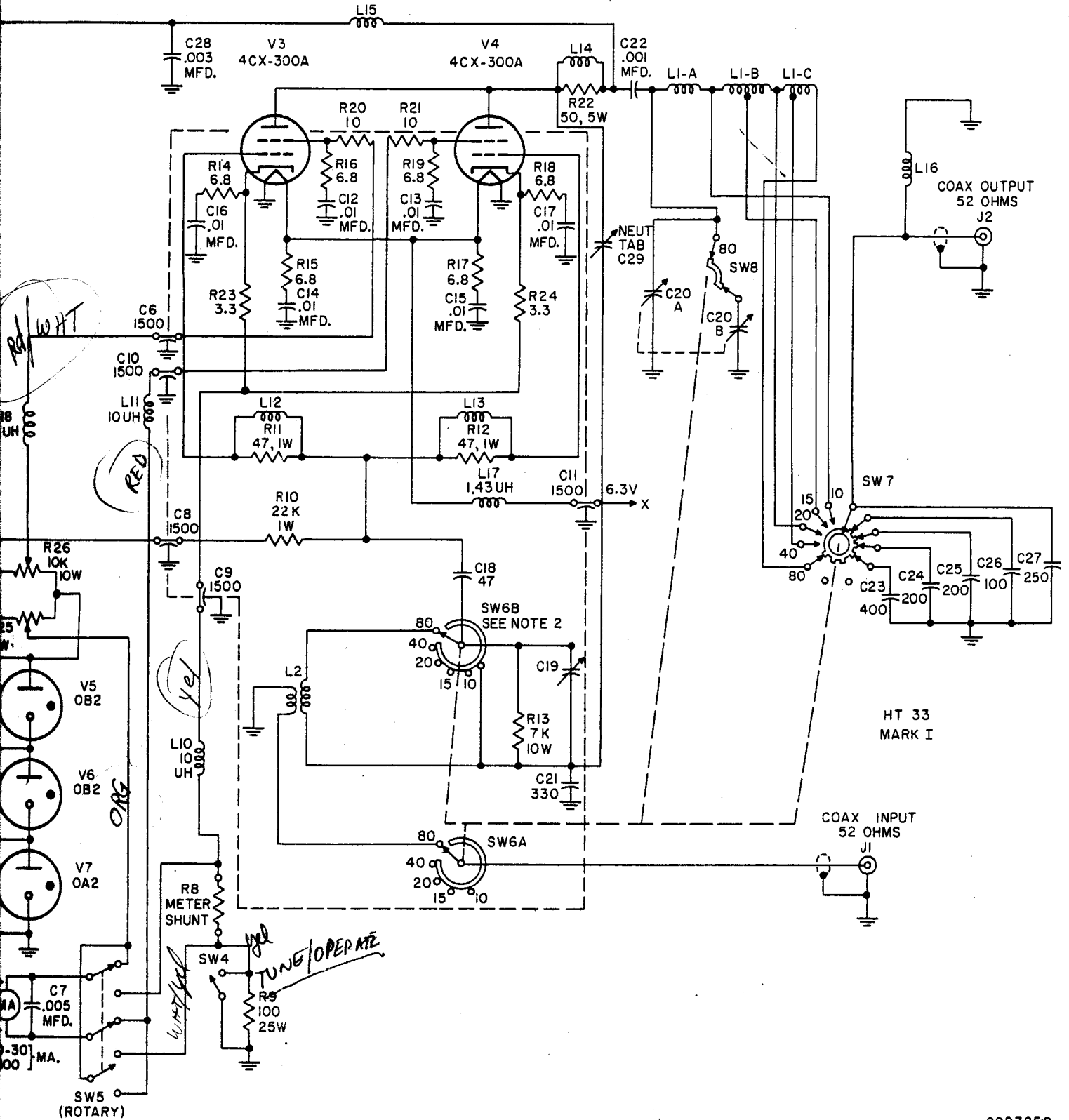
Do not keep voltage applied more than 30 seconds to prevent tube damage.

3. Remove tube from socket and install new tube in same socket. If plate current reads above 500 MA, readjust bias control until 500 MA reading is obtained.
4. Select tube which has lowest "Plate Current" reading and install it in the lower socket. (No tube in upper socket.)
5. Adjust slider on R26 until "Plate Current" on lower tube reads 500 MA.

Do not keep voltage applied more than 30 seconds.

6. Install remaining tube in upper socket and adjust bias control for normal idling current (280 MA).

Note. Resistor (R25) adjusts screen voltage on upper tube. Resistor (R26) adjusts screen voltage on lower tube.



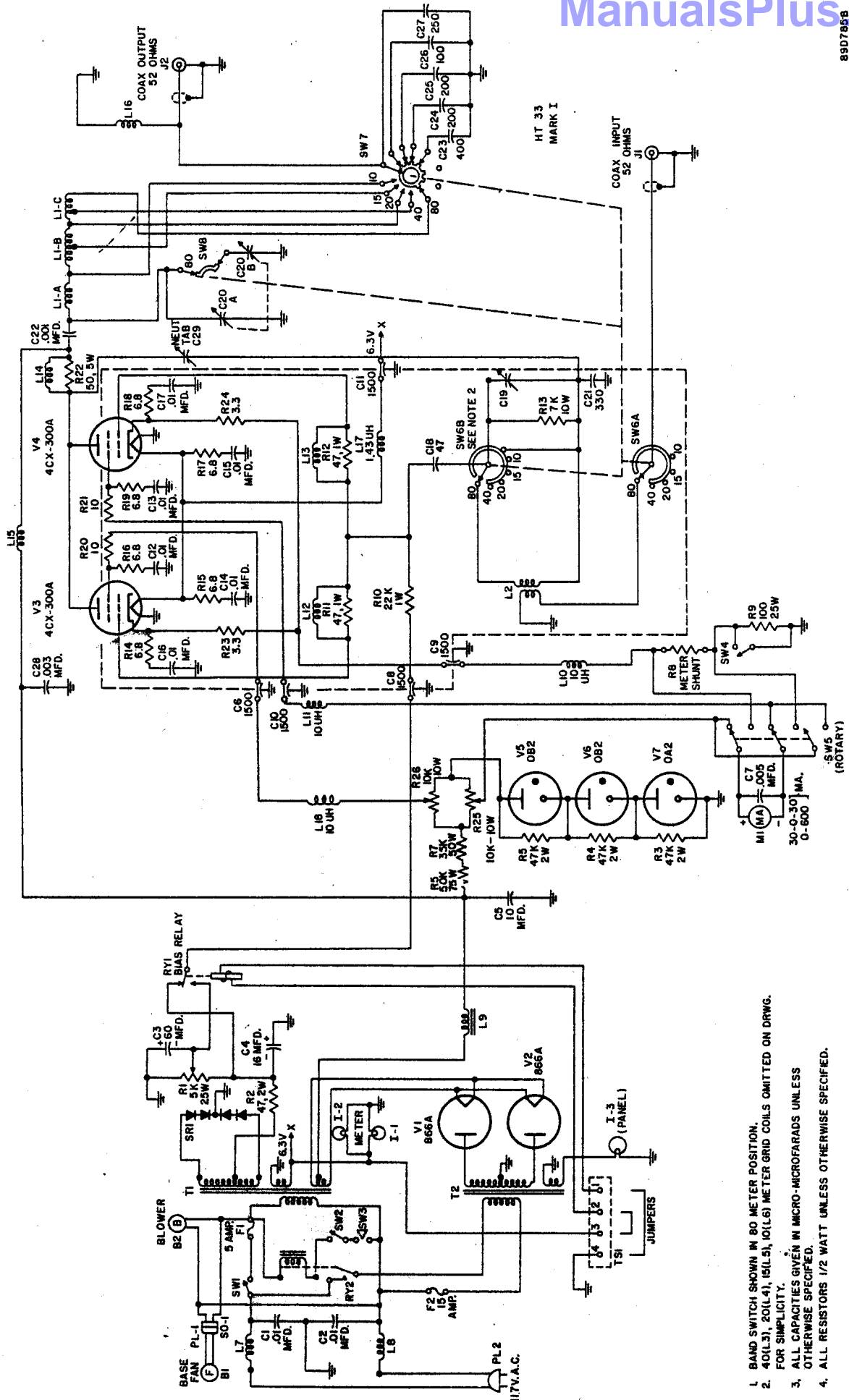


Figure 8. Chassis Schematic

1. BAND SWITCH SHOWN IN 80 METER POSITION.
2. 40L(3), 20L(4), 15L(5), 10L(6) METER GRID COILS OMITTED ON DRWG. FOR SIMPLICITY.
3. ALL CAPACITIES GIVEN IN MICRO-MICROFARADS UNLESS OTHERWISE SPECIFIED.
4. ALL RESISTORS 1/2 WATT UNLESS OTHERWISE SPECIFIED.



Eimac Power Grid Tube Reference Data



[Back to Power Grid Tube Catalog Index](#)

Additional Catalogs: [Klystrode® IOT](#) | [Remanufactured Tube](#)

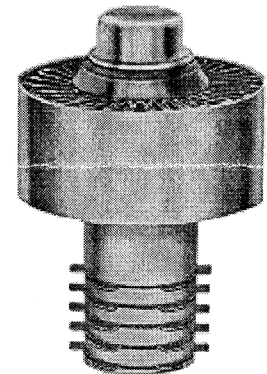


4CX300A/8167

The 4CX300A/8167 is a compact power terode having a maximum plate dissipation rating of 300 watts. The ceramic/metal construction and the internally utilized electrode structure combine to make the 4CX300A/8167 especially durable and free from mechanically induced noise under conditions of severe acceleration caused by shock or vibration.

Characteristics

Plate Dissipation (Max.)	300 Watts
Screen Dissipation (Max.)	12 Watts
Grid Dissipation (Max.)	2 Watts
Frequency for Max. rating (CW)	500 MHz
Amplification Factor	4.8
Filament/Cathode	Oxide Coated
Voltage	6.0 Volts
Current	2.9 Amps
Capacitance	Grounded Cathode
Input	29.0 pf
Output	4.0 pf
Feedthrough	.04 pf
Capacitance	---
Input	--- pf
Output	--- pf
Feedthrough	--- pf
Cooling	Forced Air
Base	Special, Breechblock
Air Socket	SK-700
Air Chimney	SK-606
Boiler	---
Length	2.50 in; 63.50 mm
Diameter	1.64 in; 41.60 mm
Weight	1.64 oz; 113 g



NOMINAL

SCREEN VOLTAGE ≈ 400VDC @ 12mA

BIAS VOLTAGE ≈ -50VDC @ 100mA

PLATE VOLTAGE ≈ 2500VDC @

50mA

Class of Operation	Type of Service	Maximum Ratings		Typical Operation					
		Plate Voltage (Volts)	Plate current (Amps)	Plate Voltage (Volts)	Screen Voltage (Volts)	Plate Current (Amps)	Drive Power (Watts)	Output Power (kiloWatts)	
C	RF Amplifier	2,000	0.25	2,000	250	0.25	2.9	0.390	
C	RF Amplifier at 500 MHz	2,000	0.25	2,000	250	0.25	---	0.225	
C	RF Amplifier Plate Modulated	1,500	0.20	1,500	250	0.20	1.7	0.235	
AB1	RF Linear Amplifier	2,500	0.25	2,500	350	0.25	---	0.400	
AB1	RF Linear Amplifier (AM Service)	2,500	0.25	2,500	350	0.15	---	0.85	

Characteristics and Operating values are based on performance tests. Figures may change without notice as the result of additional data or product refinement.

K4XL's  **BAMA**

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