

Power Triode

Forced-Air Cooled

VHF Grid-Drive or Cathode-Drive Operation

6350 Watts VHF TV
Output at 216 MHz

7000 Watts CW
Output at 30 MHz

ELECTRICAL

Filamentary Cathode, Thoriated-Tungsten Type:

Voltage (ac or dc)	{ 12.6 typical	V
	{ 13.2 max.	V
Current:		
Typical value at 12.6 volts	29	A
Maximum value for starting, even momentarily	175	A
Cold Resistance	0.052	Ω
Minimum heating time	15	s
Amplification Factor	29	
Direct Interelectrode Capacitances:		
Grid to plate	21	pF
Grid to filament	19	pF
Plate to filament	0.5	pF

MECHANICAL

Operating Position	Vertical, either end up
Overall Length	(181.1 mm) 7.13 max. in
Greatest Diameter	(119.1 mm) 4.69 max. in
Terminal Connections	See Dimensional Outline
Radiator	Integral part of tube
Weight (Approx.)	(2.8 kg) 6-1/4 lb

THERMAL

Terminal Temperature (Plate, grid and filament)	250 max. °C
Plate-Core Temperature	250 max. °C
Envelope Temperature (at hottest point)	250 max. °C

AF POWER AMPLIFIER & MODULATOR – CLASS B^a

Maximum CCS Ratings, Absolute-Maximum Values:

DC Plate Voltage	6200 max. V
Max.-Signal DC Plate Current	1.5 max. A
Max.-Signal Plate Input	8700 max. W
Plate Dissipation	5000 max. W



Typical Operation:

Values are for 2 tubes

DC Plate Voltage	4700	V
DC Grid Voltage	-200	V
Peak AF Grid-to-Grid Voltage	900	V
Zero-Signal DC Plate Current	0.3	A
Max.-Signal DC Plate Current	2.8	A
Effective Load Resistance (Plate to plate)	3640	Ω
Max.-Signal Driving Power (Approx.)	195	W
Max.-Signal Power Output (Approx.)	8800	W

**GRID MODULATED RF POWER AMPLIFIER –
CLASS C TELEVISION SERVICE^b**

Synchronizing-level conditions per tube unless otherwise specified. At frequency of 54 to 216 MHz.

Maximum CCS Ratings, Absolute-Maximum Values:

DC Plate Voltage	3700 max.	V
DC Grid Voltage (White level)	-800 max.	V
DC Plate Current	1.9 max.	A
DC Grid Current (Pedestal level)	0.225 max.	A
Plate Input	6500 max.	W
Plate Dissipation	5000 max.	W

Typical Operation in Cathode-Drive Circuit:Bandwidth^c of 8.5 MHz

DC Plate Voltage	3200	V
DC Grid Voltage:		
Synchronizing level	-110	V
Pedestal level	-220	V
White level	-520	V
Peak RF Grid Voltage	435	V
DC Plate Current:		
Synchronizing level	1.8	A
Pedestal level	1.25	A
DC Grid Current (Approx.):		
Synchronizing level	0.400	A
Pedestal level	0.130	A
Driving Power (Approx.):		
Synchronizing level	770	W
Power Output (Approx.):		
Synchronizing level	4000	W
Pedestal level	2300	W

RF POWER AMPLIFIER – CLASS B TELEVISION SERVICE^b

Synchronizing-level conditions per tube unless otherwise specified. At frequency of 54 to 216 MHz.

Maximum CCS Ratings, Absolute-Maximum Values:

DC Plate Voltage	4500 max. V
DC Plate Current	2.0 max. A
DC Grid Current (Pedestal level)	0.325 max. A
Plate Input	9000 max. W
Plate Dissipation	5000 max. W

Typical Operation in Cathode-Drive Circuit:

	Bandwidth ^c of 10 MHz	8.5 MHz	6.0 MHz	
DC Plate Voltage	3000	3200	4300	V
DC Grid Voltage	-105	-110	-150	V
Peak RF Grid Voltage:				
Synchronizing level	380	435	500	V
Pedestal level	290	310	355	V
DC Plate Current:				
Synchronizing level	1.8	1.8	2.0	A
Pedestal level	1.36	1.35	1.5	A
DC Grid Current:				
Synchronizing level	0.265	0.400	0.439	A
Pedestal level	0.115	0.130	0.118	A
Driving Power (Approx.):				
Synchronizing level	625	770	983	W
Power Output (Approx.):				
Synchronizing level	3150	4000	6350	W
Pedestal level	1800	2300	3590	W

PLATE MODULATED RF POWER AMPLIFIER – CLASS C TELEPHONY^b

Carrier conditions per tube for use with a maximum modulation factor of 1.0. See Ratings vs. Frequency Chart.

Maximum CCS Ratings, Absolute-Maximum Values:

DC Plate Voltage	5000 max. V
DC Grid Voltage	-1000 max. V
DC Plate Current	1.0 max. A
DC Grid Current	0.3 max. A
Plate Input	5000 max. W
Plate Dissipation	3300 max. W

Typical Operation in Grid-Drive Circuit:

	Up to 30 MHz	At 110 MHz	
DC Plate Voltage	4700	4000	V

DC Grid Voltage	-400	-350	V
From a grid resistor of	1425	1460	Ω
Peak RF Grid Voltage ^d	675	600	V
DC Plate Current	0.96	0.93	A
DC Grid Current (Approx.)	0.28	0.24	A
Driving Power (Approx.)	170	130	W
Power Output (Approx.)	3700	2800	W

Typical Operation in Cathode-Drive Circuit:

DC Plate Voltage	4700	4000	V
DC Grid Voltage	-400	-350	V
From a grid resistor of	1425	1460	Ω
Peak RF Grid Voltage	675	600	V
DC Plate Current	0.96	0.93	A
DC Grid Current (Approx.)	0.28	0.24	A
Driving Power (Approx.) ^e	720	600	W
Power Output (Approx.)	4200	3200	W

RF POWER AMPLIFIER & OSC. – CLASS C TELEGRAPHY^b AND

RF POWER AMPLIFIER – CLASS C FM TELEPHONY^b

See Ratings vs. Frequency Chart

Maximum CCS Ratings, Absolute-Maximum Values:

DC Plate Voltage	6200 max.	V
DC Grid Voltage	-1000 max.	V
DC Plate Current	1.4 max.	A
DC Grid Current	0.3 max.	A
Plate Input	8700 max.	W
Plate Dissipation	5000 max.	W

Typical Operation in Grid-Drive Circuit:

Up to 30 MHz

DC Plate Voltage	6000	V
DC Grid Voltage:		
From a fixed supply of	-550	V
From a grid resistor of	1900	Ω
From a cathode resistor of	360	Ω
Peak RF Grid Voltage	875	V
DC Plate Current	1.25	A
DC Grid Current (Approx.)	0.290	A
Driving Power (Approx.)	225	W
Power Output (Approx.)	6000	W

Typical Operation in Cathode-Drive Circuit:

	Up to 30 MHz	At 110 MHz	At 220 MHz	
DC Plate Voltage	6000	5000	4300	V

DC Grid Voltage:

From a fixed supply of . . .	-550	-340	-200	V
From a grid resistor of . . .	1900	1225	807	Ω
From a cathode resistor of . . .	360	208	134	Ω
Peak RF Grid Voltage	875	625	432	V
DC Plate Current	1.25	1.35	1.25	A
DC Grid Current (Approx.) . . .	0.290	0.275	0.25	A
Driving Power (Approx.) . . .	1225	1000	542	W
Power Output (Approx.) . . .	7000	5500	4000	W

SELF-RECTIFYING OSCILLATOR OR AMPLIFIER – CLASS C^b

See Ratings vs. Frequency Chart

Maximum CCS Ratings, Absolute-Maximum Values:

AC Plate Voltage (RMS)	7000 max.	V
DC Grid Voltage	-300 max.	V
DC Plate Current	0.635 max.	A
DC Grid Current	0.135 max.	A
Plate Input ^f	4900 max.	W
Plate Dissipation	5000 max.	W

Typical Operation:

AC Plate Voltage (RMS)	6600	V
DC Grid Voltage	-127	V
DC Plate Current	0.625	A
DC Grid Current (Approx.)	0.105	A
Driving Power (Approx.) ^g	60	W
Power Output (Approx.)	3350	W

AMPLIFIER OR OSCILLATOR – CLASS C^b

With separate, rectified, unfiltered, single-phase, full-wave plate supply. See Ratings vs. Frequency Chart.

Maximum CCS Ratings, Absolute-Maximum Values:

DC Plate Voltage	5600 max.	V
DC Grid Voltage	-600 max.	V
DC Plate Current	1.25 max.	A
DC Grid Current	0.270 max.	A
Plate Input ^h	8600 max.	W
Plate Dissipation	5000 max.	W

Typical Operation:

DC Plate Voltage	5000	V
DC Grid Voltage	-260	V
DC Plate Current	1.2	A
DC Grid Current (Approx.)	0.260	A
Driving Power (Approx.) ⁱ	150	W
Power Output (Approx.)	5650	W

CHARACTERISTICS RANGE VALUES

	Note	Min.	Max.	
Filament Current	k	27	31	A
Amplification Factor	k,m	25	33	
Grid-Plate Capacitance	—	18.7	22.7	pF
Grid-Filament Capacitance	—	15.5	22.5	pF
Plate-Filament Capacitance	—	0.38	0.62	pF
Grid Voltage	k,n	-125	-190	V
Plate Voltage	k,p	1350	1750	V
Plate Voltage	k,r	2600	3400	V
Useful Power Output	k,s	3	—	kW

Footnotes (a) and (b) apply to the *RCA Transmitting Tube Operating Considerations* given at front of this section.

^a See *Classes of Service — AF Power Amplifiers*.

^b See *Classes of Service — RF Power Amplifiers or Oscillators*.

^c Computed between -3 dB points in a single-tuned circuit and based on the tube output capacitance only.

^d Driver modulated approximately 30%.

^e Carrier power of driver modulated 100%.

^f Plate input is 1.11 times the product of the ac voltage (rms) and the dc plate current.

^g From a self-rectified driver.

^h Plate input is 1.23 times the product of the dc plate voltage and the dc plate current.

ⁱ From a driver with a rectified, unfiltered, single-phase, full-wave plate supply.

^k With 12.6 volts rms on filament.

^m With dc grid voltage of -25 volts measured from center tap of filament supply, and dc plate voltage adjusted to give dc plate current of 0.5 ampere.

ⁿ With dc plate voltage of 4000 volts, and dc grid voltage adjusted to give dc plate current of 0.05 ampere.

^p With dc grid voltage of 0 volts measured from center tap of filament supply, and dc plate voltage adjusted to give dc plate current of 0.5 ampere.

- ^r With dc grid voltage of -50 volts measured from center tap of filament supply, and dc plate voltage adjusted to give dc plate current of 0.5 ampere.
- ^s In a self-excited, coaxial, oscillator circuit and with dc plate voltage of 5000 volts, dc plate current of 1.1 amperes, grid resistor of $1500 \pm 10\%$ ohms, dc grid current of 0.250 to 0.300 ampere, and frequency of 110 MHz.

FORCED-AIR COOLING

Air Flow:

Through Radiator – Adequate air flow, to limit the plate-core temperature to 250°C , should be delivered by a blower through the radiator before and during the application of all voltages to the tube in accordance with “Typical Air-Cooling Characteristics”.

To Grid and Filament Terminals – 10 min. cfm. The specified air flow from a one-inch dia. nozzle, or as obtained by deflectors, should be directed into the filament header before and during the application of any voltages in order to limit the temperature of the filament and grid terminals to 250°C .

During Standby Operation – Cooling air is required when only filament voltage is applied to the tube.

During Shutdown Operation – Air flow should continue for a few minutes after all electrode power is removed.

RATINGS VERSUS FREQUENCY

Frequency has a limiting effect on certain critical parameters. These parameters include: plate voltage, plate input, grid voltage, and grid current. The permissible percentage of maximum rated value for these parameters varies with frequency and service. The service falls into two categories: 1. Television Class B or C service, and 2. all other recommended service. All other recommended service includes:

Class C Telephony, Plate Modulated
 Class C Telegraphy and FM Telephony
 Class C Amplifier or Oscillator (self-rectifying)

Class C Amplifier or Oscillator (with separate rectified unfiltered plate supply)

PERMISSIBLE PERCENTAGE OF MAXIMUM RATED VALUES

Service	TV (B, C)	All Other Service			
Frequency	54 to 216	30	110	220	MHz
Plate Voltage	100	100	84	72	%
Plate Input	100	100	84	72	%
Grid Voltage	100	100	100	60	%
Grid Current	100	100	100	83	%

ELECTRICAL

Filament

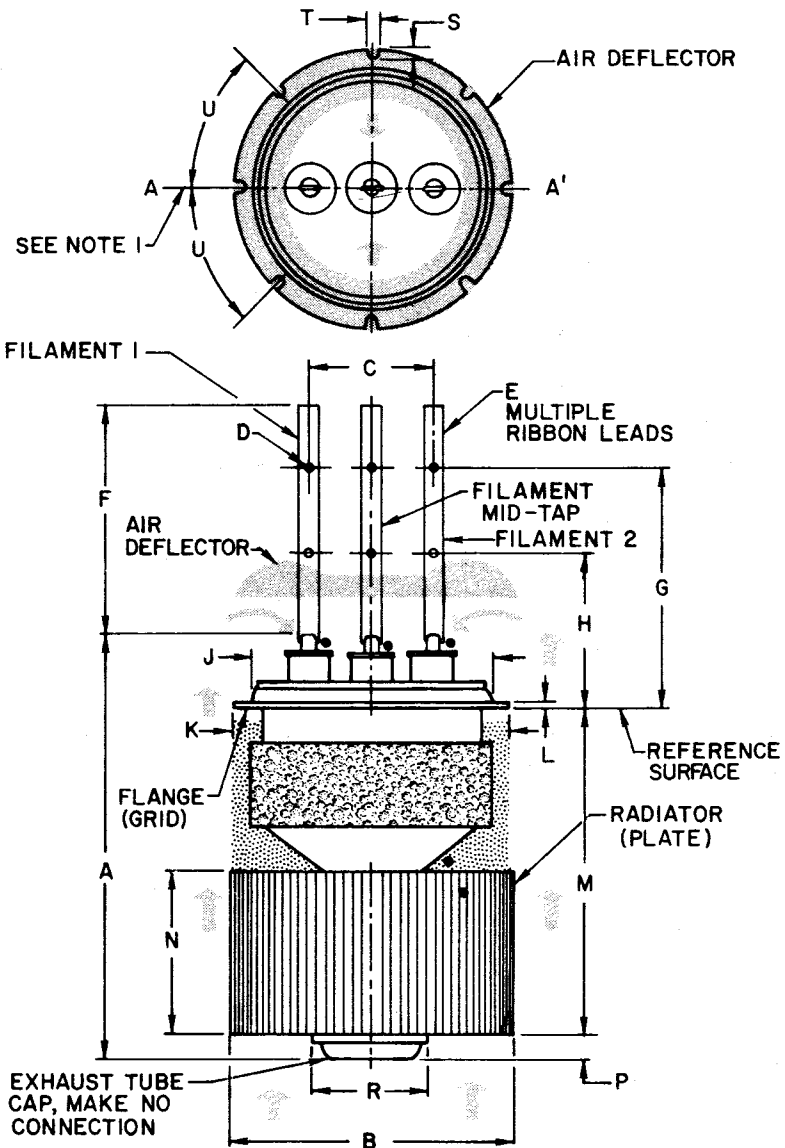
The filament is center-tapped in order to minimize the effect of filament lead inductance, and not to permit operation of the two sections in parallel. At the higher frequencies, all three filament leads should be connected in parallel by means of rf bypass capacitors. Any one of these three leads may then be used as the rf return to the filament.

MECHANICAL

Mounting

The tube requires a clamp support for the radiator (plate connection), a flexible connector for the grid-terminal flange, and three connectors for the filament leads. The tube should be supported in a vertical position with either end up or down. If the tube is subjected in service to considerable vibration, it is advisable to support the mounting by means of a spring suspension. The installation of all wires and connections must be made so that they will not intrude upon the stippled area.

DIMENSIONAL OUTLINE



NOTE 2



CERAMIC INSULATOR

TERMINAL TEMPERATURE
MEASUREMENT POINT

AIR FLOW

92LM-2959

NOTES FOR DIMENSIONAL OUTLINE

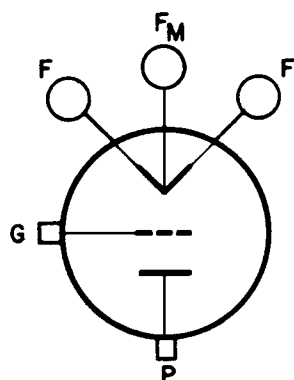
1. Plane of filament leads will not deviate more than $3\frac{1}{2}^{\circ}$ from plane passing through AA', normal to grid flange.
2. Keep all stippled regions clear. In general do not allow intrusions into these annular regions. If such intrusions are required contact RCA Power Tube Application Engineering, Lancaster, PA for instructions.

OUTLINE DIMENSIONS*

Dimension		Value	
A	7.12	(180.85)	Max.
B	$4.62 \pm .06$	(117.4 ± 1.5)	
C	2.5	(63.5)	Max.
D Dia.	0.144	(3.658)	
E	$0.31 \pm .06$	(7.9 ± 1.5)	
F	3.5	(88.9)	Min.
G	$3.88 \pm .38$	(98.5 ± 9.7)	
H	$2.50 \pm .38$	(63.5 ± 9.7)	
J Dia.	3.94	(100.08)	Max.
K Dia.	$4.56 \pm .03$	$(115.8 \pm .8)$	
L	$0.062 \pm .015$	$(1.58 \pm .38)$	
M	$5.25 \pm .12$	(133.4 ± 3.1)	
N	2.75	(69.85)	Max.
P	0.5	(12.7)	Max.
R	2.0	(50.8)	Max.
S	0.210	(5.334)	
T	0.182	(4.623)	
U	45°	0.785 Radian	

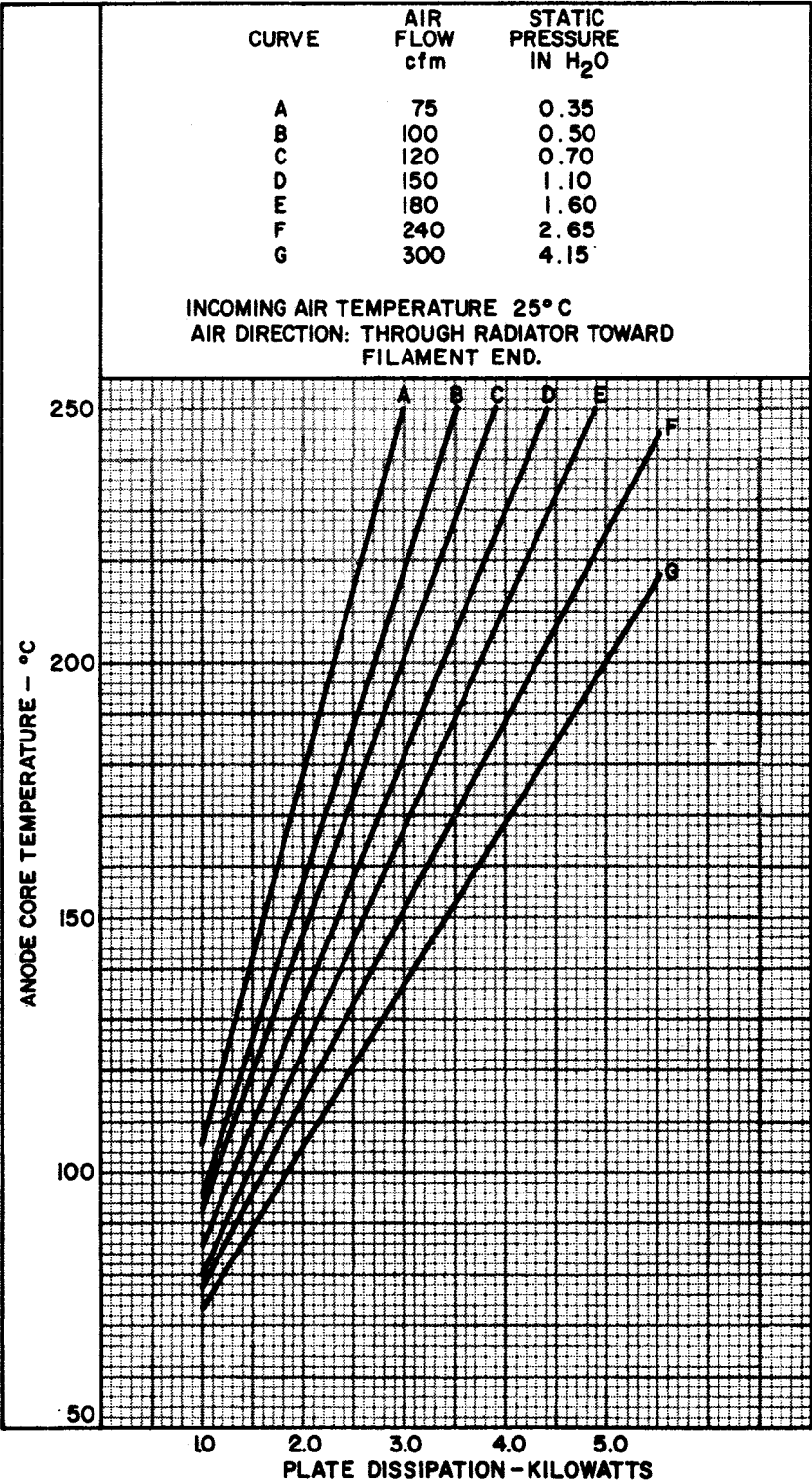
*Dimensions are in inches unless otherwise stated. Dimensions in parentheses are in millimeters.

TERMINAL DIAGRAM



F₁: filament 1
 F_m: filament mid-tap
 F₂: filament 2
 G: grid-flange
 P: plate-radiator

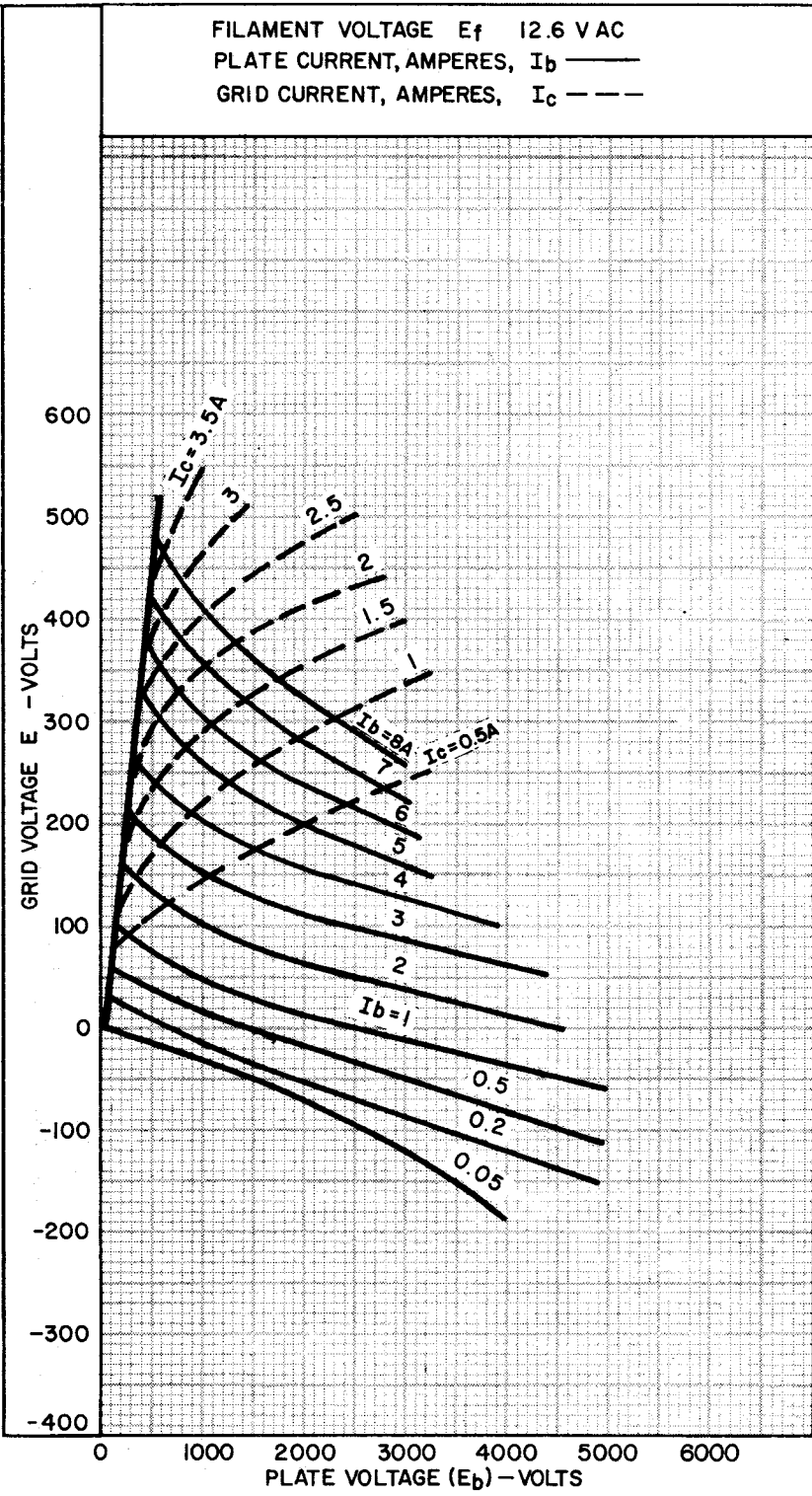
TYPICAL AIR-COOLING CHARACTERISTICS



92LM-2960



TYPICAL CONSTANT-CURRENT CHARACTERISTICS



92LM-2963