

CERMOLOX[®]
 Matrix-Type Unipotential Cathode
 Forced-Air Cooled
 1350 Watts CW Power Output
 at 500 Mc

RCA-7213
BEAM POWER TUBE
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RCA-7213 is a small, forced-air-cooled uhf beam power tube designed for use in compact aircraft, mobile and stationary equipment. It is rated to frequencies up to 1215 Mc as a linear rf power amplifier in single-sideband suppressed-carrier service, as a plate-modulated rf power amplifier in Class C telephony service, as an rf power amplifier and oscillator in Class C telegraphy service, and as an rf power amplifier in Class C FM telephony service.

The 7213 and variants of its basic design may also be useful in applications such as frequency multipliers, af power amplifiers or modulators, linear rf power amplifiers (AM or television), hard-tube modulators, pulsed-rf amplifiers, regulators, or other special services. Variations in cooling structure or other parameters are also possible. For information on variants, contact your RCA field representative, or the nearest District Sales Office.

The 7213 features the Cermolox construction, a unipotential cathode of the oxide-coated matrix type, and an integral louvered-fin radiator. Details of these features are described in the Application Guide for RCA Power Tubes, ICE-300[•].

GENERAL DATA

Electrical:

Heater for Matrix-Type Oxide-Coated Unipotential Cathode:

Voltage (ac or dc)	{ 5.5 typical volts	volts
	{ 6.0 max.	volts
Current at 5.5 volts	17.3	amp
Minimum heating time	5	minutes

See further information on the heater in Application Guide for RCA Power Tubes, ICE-300; Section V.A.3, Filament or Heater.

Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 2500, grid No.2 volts = 600, and plate ma = 600 17

Direct Interelectrode Capacitances:

Grid No.1 to plate ^a	0.17 max.	pf
Grid No.1 to cathode & heater	42	pf
Plate to cathode & heater ^{a,b}	0.017 max.	pf
Grid No.1 to grid No.2	55	pf
Grid No.2 to plate	16	pf
Grid No.2 to cathode & heater ^b	1.4 max.	pf

Mechanical:

Operating Position	Any
Overall Length	3.34" max.
Greatest Diameter	3.75" max.
Terminal Connections	See Dimensional Outline
Radiator	Integral part of tube
Weight (Approx.)	2 lbs.

Thermal:

Terminal Temperature (Plate, grid No.2, grid No.1, cathode, and heater)	250 max.	°C
Plate-Seal Temperature	250 max.	°C

See Dimensional Outline for temperature-measurement points

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<p>• This bulletin is to be used in conjunction with the publication Application Guide for RCA Power Tubes, ICE-300. For a copy, write RCA, Commercial Engineering, Harrison, N.J.</p>		

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LINEAR RF POWER AMPLIFIER, CLASS AB₁^c

Single-Sideband Suppressed-Carrier Service

Peak envelope conditions for a signal having a minimum peak-to-average power ratio of 2

Maximum CCS Ratings, Absolute Values:

	Up to 1215 Mc	
DC PLATE VOLTAGE	3000 max.	volts
DC GRID-No.2 VOLTAGE	1000 max.	volts
MAX.-SIGNAL DC PLATE CURRENT	1.0 max.	amp
MAX.-SIGNAL DC GRID-No.1 CURRENT	0.2 max.	amp
MAX.-SIGNAL PLATE INPUT	2500 max.	watts
MAX.-SIGNAL GRID-No.2 INPUT	50 max.	watts
PLATE DISSIPATION	1500 max.	watts

Typical CCS Class AB₁ "Single-Tone" Operation:

	Up to 60 Mc		
DC Plate Voltage	2250	2500	volt
DC Grid-No.2 Voltage	700	700	volt
DC Grid-No.1 Voltage	-50	-50	volt
Zero-Signal DC Plate Current	0.2	0.2	a
Zero-Signal DC Grid-No.2 Current	0	0	a
Effective RF-Load Resistance	1100	1100	ohm
Max.-Signal DC Plate Current	0.9	1.0	an
Max.-Signal DC Grid-No.2 Current	0.045	0.045	an
Max.-Signal DC Grid-No.1 Current	0	0	an
Max.-Signal Peak RF Grid-No.1 Voltage	50	50	volt
Max.-Signal Driving Power (Approx.)	0	0	watt
Max.-Signal Power Output (Approx.)	1000	1250	watt

Maximum Circuit Values:

Grid-No.1 Circuit Resistance Under Any Condition:

- With fixed bias 5000 max. ohms
- With fixed bias (in Class AB₁ operation) Not recommended
- With cathode bias Not recommended

Grid-No.2 Circuit Impedance See note d

Plate Circuit Impedance See note e

PLATE-MODULATED RF POWER AMP.—

Class C Telephony^c

Carrier conditions per tube for use with max. modulation factor of 1.0

Maximum CCS Ratings, Absolute Values:

	Up to 1215 Mc	
DC PLATE VOLTAGE	2500 max.	volts
DC GRID-No.2 VOLTAGE	1000 max.	volts
DC GRID-No.1 VOLTAGE	-300 max.	volts
DC PLATE CURRENT	0.85 max.	amp
DC GRID-No.1 CURRENT	0.2 max.	amp
PLATE INPUT	1700 max.	watts
GRID-No.2 INPUT	35 max.	watts
PLATE DISSIPATION	1000 max.	watts

Typical CCS Operation in

Grid-Drive Circuit at 600 Mc:

DC Plate Voltage	1800	2000	volts
DC Grid-No.2 Voltage	500	500	volts
DC Grid-No.1 Voltage	-75	-75	volts
DC Plate Current	0.75	0.83	amp
DC Grid-No.2 Current	0.015	0.015	amp
DC Grid-No.1 Current (Approx.)	0.04	0.04	amp
Driver Power Output (Approx.)	50	55	watts
Useful Power Output (Approx.)	650	800	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance: Under any condition 5000 max. ohms

FOOTNOTES

^a With external flat metal shield having diameter of 8", and center hole approximately 3" in diameter provided with spring fingers that connect the shield to grid-No.2 terminal. Shield is located in plane of grid-No.2 terminal perpendicular to the tube axis.

^b With external flat metal shield having diameter of 8", and center hole approximately 2-3/8" in diameter provided with spring fingers that connect the shield to grid-No.1 terminal. Shield is located in plane of grid-No.1 terminal perpendicular to the tube axis.

^c See Section V.C or ICE-300.

^d See Section V.B.2 of ICE-300.

^e See Section V.B.1 of ICE-300.

RF POWER AMPLIFIER & OSC. — Class C Telephony^F
and
RF POWER AMPLIFIER — Class C FM Telephony^C

Maximum CCS Ratings, Absolute Values:
Up to 1215 Mc

DC PLATE VOLTAGE.	3000 max.	volts
DC GRID-No.2 VOLTAGE.	1000 max.	volts
DC GRID-No.1 VOLTAGE.	-300 max.	volts
DC PLATE CURRENT.	1.0 max.	amp
DC GRID-No.1 CURRENT.	0.2 max.	amp
PLATE INPUT	2500 max.	watts
GRID-No.2 INPUT	50 max.	watts
PLATE DISSIPATION	1500 max.	watts

Typical CCS Operation in
 Grid-Drive Circuit at 600 Mc:

DC Plate Voltage.	2250	2500	volts
DC Grid-No.2 Voltage.	500	500	volts
DC Grid-No.1 Voltage.	-75	-75	volts
DC Plate Current.	0.9	1.0	amp
DC Grid-No.2 Current.	0.02	0.02	amp
DC Grid-No.1 Current (Approx.)	0.07	0.07	amp
Output Circuit Efficiency (Approx.)	90	90	%
Driver Power Output (Approx.)	70	75	watts
Useful Power Output (Approx.)	1050	1350	watts

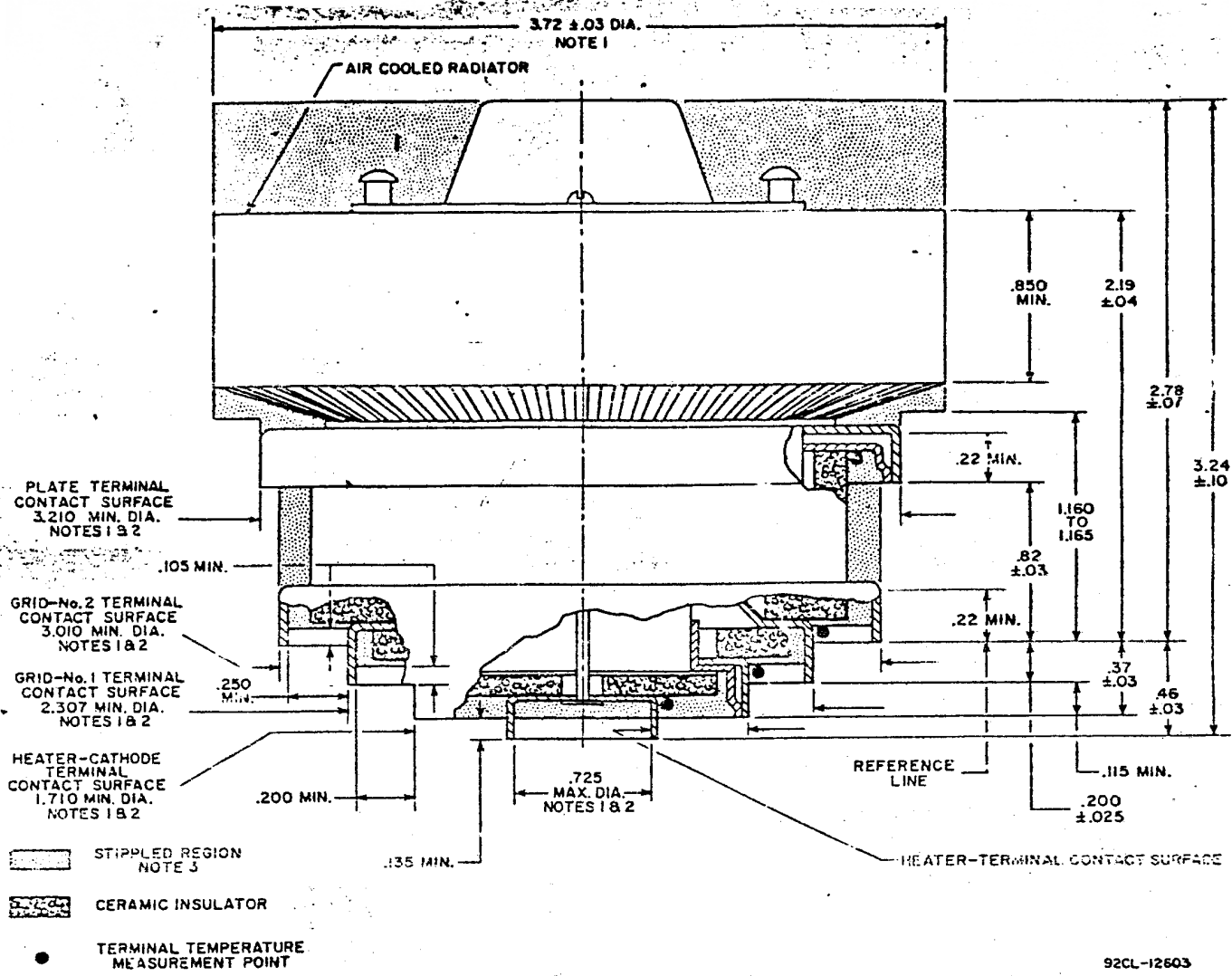
Maximum Circuit Values:
 Grid-No.1-Circuit Resistance:
 Under any condition 5000 max. ohms

CHARACTERISTICS RANGE VALUES

	Note	Min.	Max.	
1. Heater Current	1	16.3	18.2	amp
2. Direct Interelectrode Capacitances:				
Grid No.1 to plate	2	-	0.17	pf
Grid No.1 to cathode & heater	-	37	46	pf
Plate to cathode & heater	2,3	-	0.017	pf
Grid No.1 to grid No.2	-	46	62	pf
Grid No.2 to plate	-	14.6	17.8	pf
Grid No.2 to cathode & heater	3	-	1.4	pf
3. Mu-Factor, Grid No.2 to Grid No.1	1,4	8	24	
4. Cutoff Grid-No.1 Voltage	1,5	-	-140	volts
5. Grid-No.2 Current	1,6	-28	+12	ma
6. Useful Power Output	1,7	1000	-	watts
7. Low-Frequency Vibration	1,8	-	500	mv
8. High-Frequency Vibration	9	(See Note 9)		

- Note 1: With 5.5 volts ac on heater.
- Note 2: With external flat metal shield having diameter of 8", and center hole approximately 3" in diameter provided with spring fingers that connect the shield to grid-No.2 terminal. Shield is located in plane of grid-No.2 terminal perpendicular to the tube axis.
- Note 3: With external flat metal shield having diameter of 8", and center hole approximately 2-3/8" in diameter provided with spring fingers that connect the shield to grid-No.1 terminal. Shield is located in plane of grid-No.1 terminal perpendicular to the tube axis.
- Note 4: With dc plate voltage of 2500 volts, dc grid-No.2 voltage of 600 volts, and dc grid-No.1 voltage adjusted to give a plate current of 0.6 amperes.
- Note 5: With dc plate voltage of 3000 volts, dc grid-No.2 voltage of 1000 volts, and dc grid-No.1 voltage adjusted to give a plate current of 20 ma.
- Note 6: With dc plate voltage of 2500 volts, dc grid-No.2 voltage of 500 volts, and dc grid-No.1 voltage adjusted to give a plate current of 0.6 ampere.
- Note 7: In a CW cathode-driven amplifier circuit at 600 Mc and for conditions: dc plate voltage at 2500 volts, dc grid-No.2 voltage of 700 volts, and dc grid-No.1 voltage adjusted to give a plate current of 1.0 ampere.
- Note 8: As specified in MIL-E-1E Test Method 1031, and with plate voltage of 450 volts, grid-No.2 voltage of 300 volts, grid-No.1 voltage varied to give a plate current of 10 ma, and plate load resistor of 2000 ohms.
- Note 9: As specified in MIL-E-1E Test Method 1031.

DIMENSIONAL OUTLINE



92CL-12603

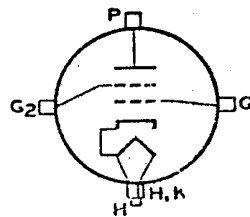
NOTE 1: CONCENTRICITY BETWEEN THE VARIOUS DIAMETERS IS SUCH THAT THE TUBE WILL ENTER A GAUGE HAVING SUITABLY SPACED CONCENTRIC APERTURES AND POSTS OF THE FOLLOWING DIAMETERS:

- a. Radiator Band - 3.7805
- b. Plate Terminal - 3.2605
- c. Grid-No.2 Terminal - 3.0605
- d. Grid-No.1 Terminal - 2.3375
- e. Heater-Cathode Terminal - 1.7445
- f. Heater Terminal - 0.6945

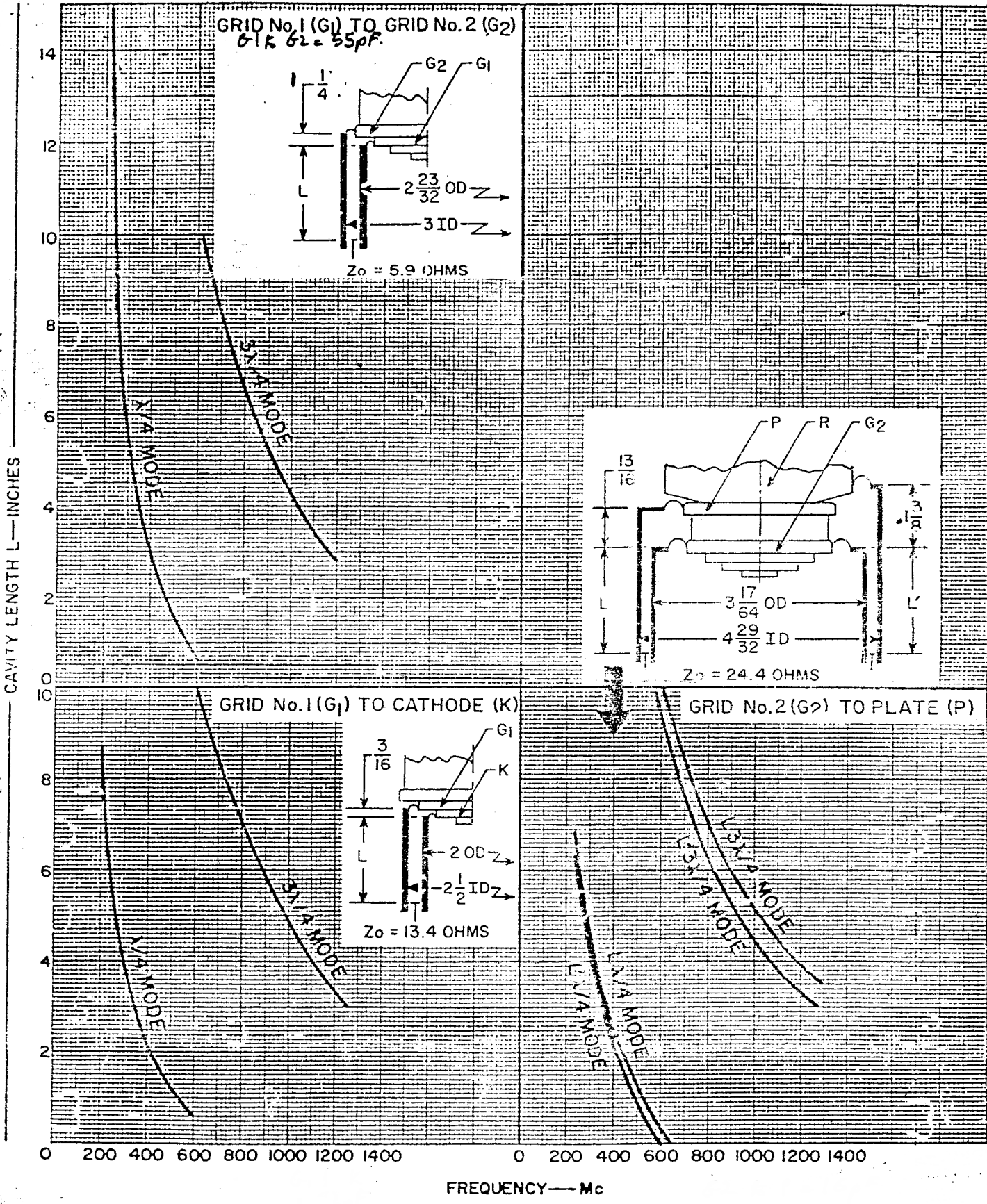
NOTE 2: THE DIAMETER OF THE TERMINAL IS HELD TO THE INDICATED VALUE ONLY OVER THE CONTACT SURFACE LENGTH. THE CONTACT SURFACE LENGTH OF THE HEATER-CATHODE AND GRID-No.1 TERMINALS EXTENDS FROM THE EDGE OF ITS TERMINAL TO THE PLANE COINCIDENT WITH THE EDGE OF THE ADJACENT LARGER TERMINAL.

NOTE 3: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR VOLUMES. DIAMETERS OF STIPPLED AREAS ABOVE AIR-COOLED RADIATOR, PLATE TERMINAL CONTACT SURFACE, AND GRID-No.2 TERMINAL CONTACT SURFACE SHALL NOT BE GREATER THAN ITS ASSOCIATED DIAMETER.

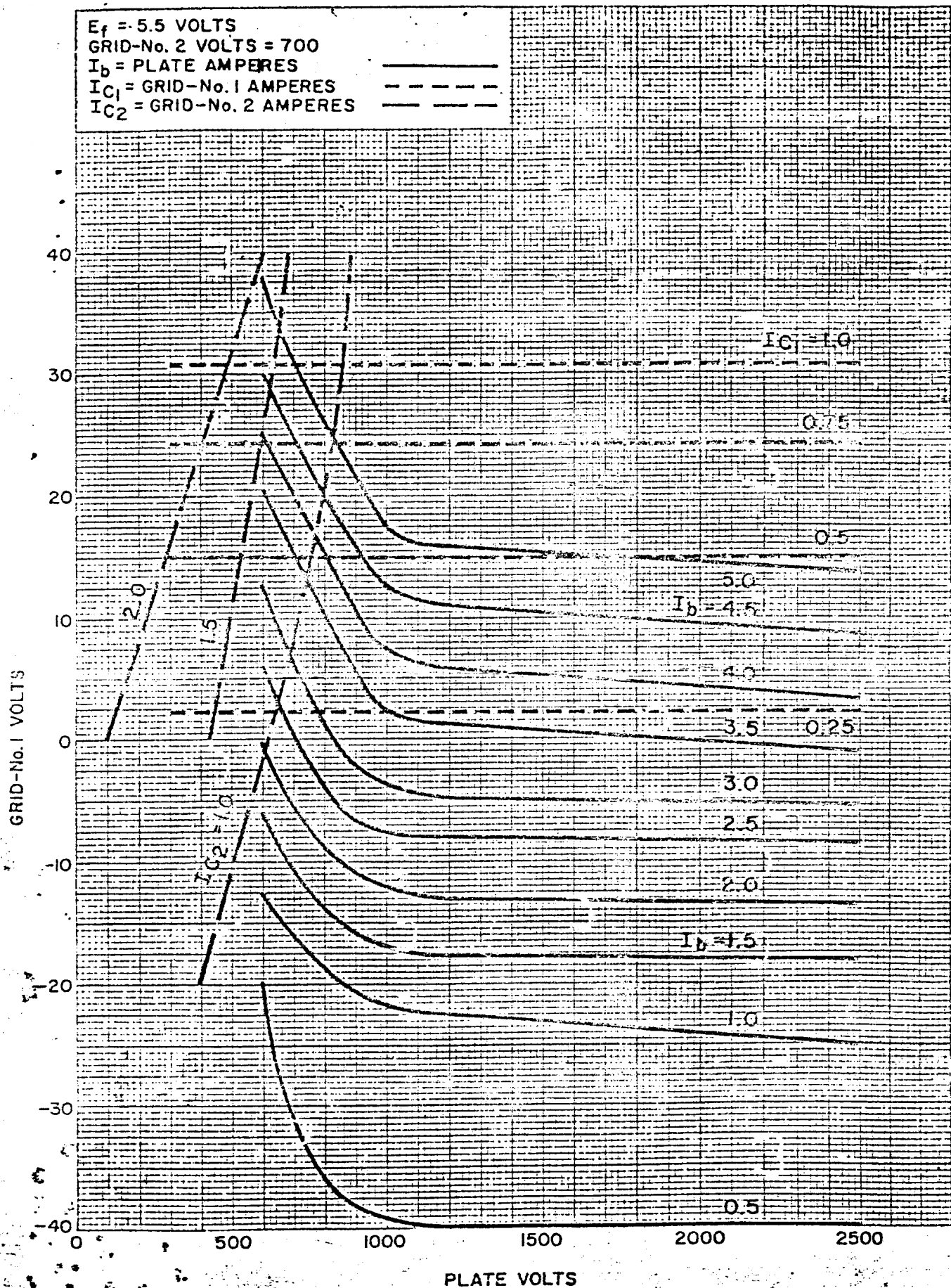
TERMINAL DIAGRAM



TUNING CHARACTERISTICS



TYPICAL CONSTANT-CURRENT CHARACTERISTICS
 With Grid-No.2 Volts = 700



92CM-9752R1

FORCED-AIR COOLING

Air Flow:

Through radiator — Adequate air flow to limit the plate-seal temperature to 250° C should be delivered by a blower, such as Rotron® AXIMAX 2, KS-408, or equivalent, through the radiator before and during the application of heater, plate, grid-No.2, and grid No.1 voltages. See graph, Typical Cooling Characteristics.

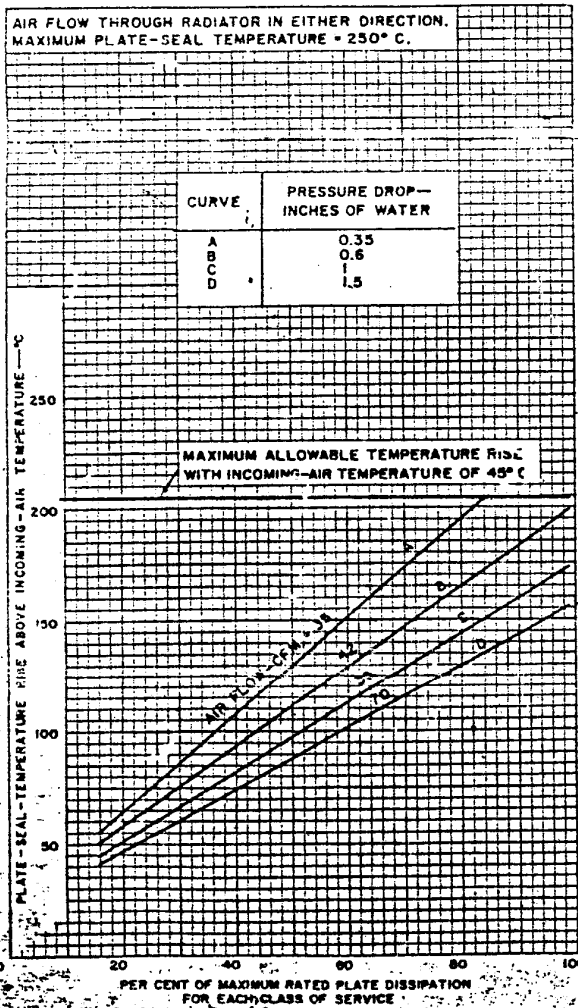
To Plate, Grid-No.2, Grid-No.1, Heater-Cathode, and Heater Terminals — A sufficient quantity of air should be allowed to flow past each of these terminals so that their temperature does not exceed the specified maximum value of 250° C.

During Standby Operation — Cooling air is required to the Heater-Cathode and Heater Terminals when only heater voltage is applied to the tube.

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

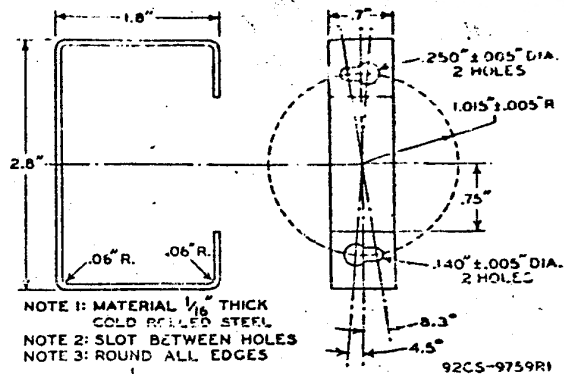
* Rotron Mfg. Co., Inc., Woodstock, N.Y.

TYPICAL COOLING CHARACTERISTICS



TUBE EXTRACTOR

Suggested Design



Mounting

See the preferred mounting arrangement below. See section III.C.3.a of ICE-300 for a description of the fixed method of mounting. The adjustable method is not recommended for the 7213.

PREFERRED MOUNTING ARRANGEMENT

