



3E29

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# TWIN-UNIT BEAM POWER AMPLIFIER

Similar to Type 829-B, but intended particularly for pulse modulator service. Unless otherwise specified, values are for both units

## GENERAL DATA

### Electrical:

Heater, for Unipotential Cathodes:

Heater Arrangement	Series	Parallel	
Voltage . . . . .	12.6*	6.3*	ac or dc volts
Current . . . . .	1.125	2.25	amp

Transconductance, per Unit (Approx.):

for plate current of 60 ma. . . . . 8500 . . . . .  $\mu$ hos

Grid-Screen Mu-factor, per unit. . . . . 9

Direct Interelectrode Capacitances (Each Unit):

Grid No.1 to Plate <sup>o</sup> . . . . .	0.12 max.	$\mu$ f
Input . . . . .	14.5	$\mu$ f
Output . . . . .	7.0	$\mu$ f

Grid-No.2 to Cathode Capacitance, (Including internal grid-No.2 by-pass capacitor). . . . . 65  $\mu$ f

\* Should not deviate more than +10% or -5% from value shown.

<sup>o</sup> with external shield.

### Mechanical:

Mounting Position. . . . . Vertical, base up or down  
Horizontal, plane of each plate vertical

Overall Length . . . . . 4-1/8"  $\pm$  3/16"

Seated Length. . . . . 3-11/16"  $\pm$  3/16"

Maximum Diameter . . . . . See Outline Drawing

Bulb . . . . . T-16

Bulb Terminals (Two) . . . . . See Outline Drawing

Base . . . . . Medium Molded-Flare Septar 7-Pin

Basing Designation for BOTTOM VIEW . . . . . 7BP

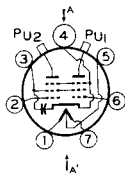
Pin 1-Heater . . . . . Pin 6-Grid No.1 of Unit No.1

Pin 2-Grid No.1 of Unit No.2 . . . . . Pin 7-Heater

Pin 3-Grid No.2 of Both Units

Pin 4-Cathode, Grid No.3 Both Units

Pin 5-Heater Center-Tap



PLANE OF ELECTRODES OF EACH UNIT IS PARALLEL TO PLANE THROUGH AXIS OF TUBE AND AA'

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## TWIN-UNIT BEAM POWER AMPLIFIER

## MODULATOR - Rectangular-Wave Modulation

Maximum CCS<sup>•</sup> Ratings, Absolute Values:

(Values for both units in parallel)

For Pulse Length of	7 max.	1.2 max.	$\mu$ sec
DC PLATE-SUPPLY VOLTAGE <sup>▲</sup> . . . . .	5000 max.	5000 max.	volts
INSTANTANEOUS PLATE VOLTAGE. . .	5750 max.	5750 max.	volts
DC GRID-No.2 (SCREEN) SUPPLY VOLT. <sup>▲</sup>	850 max.	850 max.	volts
DC GRID-No.1 (CONTROL GRID) SUPPLY VOLTAGE . . . . .	-200 max.	-200 max.	volts
INSTANTANEOUS GRID-No.1 VOLT. . .	-600 max.	-600 max.	volts
PEAK POSITIVE GRID-No.1 VOLT. . .	250 max.	250 max.	volts
PEAK PLATE CURRENT . . . . .	1.5 max.	10 max.	amp
PEAK GRID-No.2 CURRENT . . . . .	0.5 max.	0.5 max.	amp
PEAK GRID-No.1 CURRENT . . . . .	0.6 max.	4 max.	amp
PLATE INPUT. . . . .	85 max.	60 max.	watts
GRID-No.2 INPUT. . . . .	3 max.	3 max.	watts
GRID-No.1 INPUT. . . . .	1 max.	1 max.	watt
PLATE DISSIPATION. . . . .	15 max.	15 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode . . . . .	100 max.	100 max.	volts
Heater positive with respect to cathode . . . . .	100 max.	100 max.	volts

## Typical Operation with Rectangular-Wave Shapes:

(In accompanying test circuit)

With duty factor# of	$2 \times 10^{-3}$	$10^{-3}$	
DC Plate-Supply Voltage. . . . .	2000 . .	5000 . .	volts
DC Grid-No.2 Supply Volt. . . . .	650 . .	850 . .	volts
DC Grid-No.1 Supply Volt. . . . .	-175 . .	-200 . .	volts
Peak Positive Grid-No.1 Volt. . . . .	50 . .	150 . .	volts
Peak Plate Current . . . . .	5 . .	10 . .	amp
DC Plate Current . . . . .	10 . .	10 . .	ma.
DC Grid-No.2 Current . . . . .	1.1 . .	1.7 . .	ma.
DC Grid-No.1 Current . . . . .	1.0 . .	1.5 . .	ma.
Load Resistance. . . . .	300 . .	300 . .	ohms

• Continuous Commercial Service.

▲ For tube protection, it is essential that the dc resistance of the plate supply and of the screen supply be sufficiently large to limit the short-circuit current to 0.5 ampere in either circuit.

# Duty factor = pulse length multiplied by repetition rate.

OUTLINE DIMENSIONS for the 3E29 are the same as those shown for Type 829-B

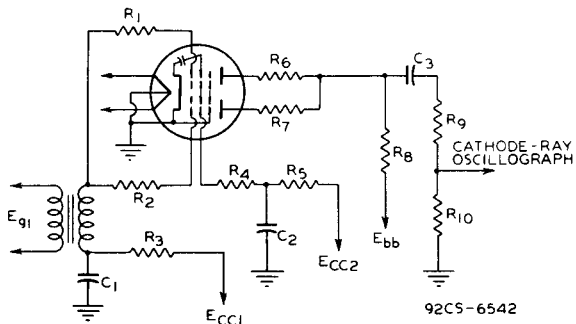


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# TWIN-UNIT BEAM POWER AMPLIFIER

TEST CIRCUIT



92CS-6542

- |                               |  |
|-------------------------------|--|
| R1 R2: 20 Ohms, non-inductive | C1: 0.1 $\mu$ f, 600 V., DC              |
| R3: 1500 Ohms                 | C2: 0.1 $\mu$ f, 1000 V., DC             |
| R4: 25 Ohms, non-inductive    | C3: 0.1 $\mu$ f, 5000 V., DC             |
| R5: 1500 Ohms                 | E <sub>cc1</sub> : Grid-Supply Voltage   |
| R6 R7: 10 Ohms, non-inductive | E <sub>cc2</sub> : Screen-Supply Voltage |
| R8: 10000 Ohms                | E <sub>bb</sub> : Plate-Supply Voltage   |
| R9: 400 Ohms                  | E <sub>g1</sub> : Signal Voltage         |
| R10: 10 Ohms                  |  |

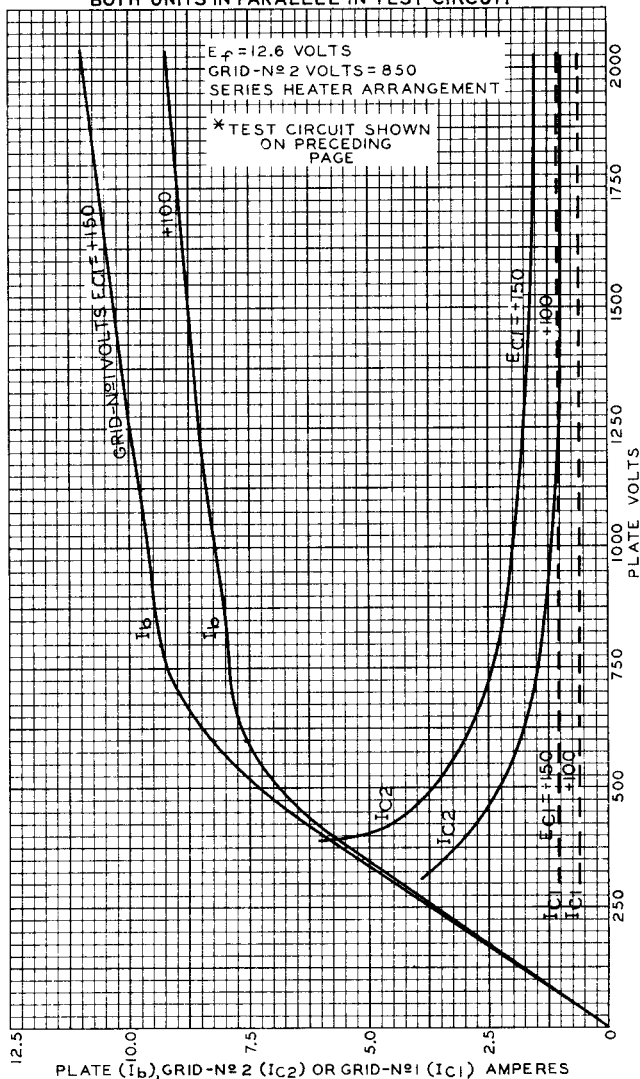
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### AVERAGE CHARACTERISTICS BOTH UNITS IN PARALLEL IN TEST CIRCUIT \*



NOV. 25, 1946

TUBE DEPARTMENT

92CM-6530R1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



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# TWIN-UNIT BEAM POWER TUBE

Unless Otherwise Specified, Values are on a Per Tube Basis

## GENERAL DATA

### Electrical:

Heater, for Unipotential Cathodes:

Arrangement	Parallel	Series	
Voltage (AC or DC) . . . . .	6.3 <sup>+10%</sup> <sub>-5%</sub>	12.6 <sup>+10%</sup> <sub>-5%</sub>	volts
Current at 6.3 volts . . . . .	2.25	-	amp
Current at 12.6 volts . . . . .	-	1.125	amp

Transconductance (Each Unit):

With plate volts = 250, grid- No.2 volts = 175, and plate ma. = 60 . . . . .	8500	$\mu$ hos
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Mu-Factor, Grid No.2 to Grid No.1  
(Each Unit):

With plate volts = 225, grid- No.2 volts = 225, and plate ma. = 60 . . . . .	9	
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Direct Interelectrode Capacitances (Each Unit):

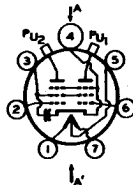
Grid No.1 to plate (with external shield <sup>□</sup> ) . . . . .	0.12 max.	$\mu$ f
Input . . . . .	14	$\mu$ f
Output . . . . .	7	$\mu$ f

### Mechanical:

Mounting Position . . . . .	Vertical, base up or down; Horizontal, plane of each plate vertical
Overall Length . . . . .	4-1/8" $\pm$ 3/16"
Seated Length . . . . .	3-11/16" $\pm$ 3/16"
Maximum Diameter . . . . .	2-3/8"
Bulb . . . . .	T-16
Bulb Terminals (Two) . . . . .	See Dimensional Outline
Weight (Approx.) . . . . .	3.5 oz.
Base . . . . .	Medium Molded-Flare Septar 7-Pin (JETEC No.E7-2)

### BOTTOM VIEW

- Pin 1 - Heater
- Pin 2 - Grid No.1 of Unit No.2
- Pin 3 - Grid No.2 of Both Units
- Pin 4 - Cathode, Grid No.3 of Both Units
- Pin 5 - Heater Center-Tap



- Pin 6 - Grid No.1 of Unit No.1
- Pin 7 - Heater

- PU1 - Plate Terminal of Unit No.1
- PU2 - Plate Terminal of Unit No.2

PLANE OF ELECTRODES OF EACH UNIT IS PARALLEL TO PLANE THROUGH AXIS OF TUBE AND AA'

□: See next page.

← Indicates a change

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## TWIN-UNIT BEAM POWER TUBE

### MODULATOR—Rectangular-Wave Modulation

Values are for Units in Parallel

#### Maximum CCS\* Ratings, Absolute Values:

For Duty Factor\* between 0.0001 and 1.0  
and Maximum Averaging Time of 1200  $\mu$ sec in Any Interval

DC PLATE SUPPLY VOLTAGE <sup>▲</sup> . . . . .	5000 max.	volts
INSTANTANEOUS PLATE VOLTAGE . . . . .	5750 max.	volts
DC GRID-No.2 (SCREEN) SUPPLY VOLTAGE <sup>▲</sup> . . . . .	850 max.	volts
DC GRID-No.1 (CONTROL-GRID) SUPPLY VOLTAGE <sup>▲</sup> . . . . .	-225 max.	volts
INSTANTANEOUS GRID-No.1 VOLTAGE . . . . .	-600 max.	volts
PEAK POSITIVE GRID-No.1 VOLTAGE . . . . .	250 max.	volts
PEAK PLATE CURRENT . . . . .	See Rating Chart	
PEAK GRID-No.2 CURRENT . . . . .	3.5 max.	amp
PEAK GRID-No.1 CURRENT . . . . .	4 max.	amp
PLATE INPUT . . . . .	85 max.	watts
GRID-No.2 INPUT . . . . .	3 max.	watts
GRID-No.1 INPUT . . . . .	1 max.	watt
PLATE DISSIPATION <sup>§</sup> . . . . .	15 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode . . . . .	100 max.	volts
Heater positive with respect to cathode . . . . .	100 max.	volts

#### Typical Operation with Rectangular-Wave Shapes in Accompanying Test Circuit:

	With Duty Factor* of		
	0.002	0.001	
DC Plate Supply Voltage . . . . .	2000	5000	volts
DC Grid-No.2 Supply Voltage . . . . .	650	850	volts
DC Grid-No.1 Supply Voltage . . . . .	-175	-200	volts
Peak Positive Grid-No.1 Voltage . . . . .	50	150	volts

□ Having length of 3/4" and inside diameter of 2-3/8". Shield is placed around base end of tube and is connected to cathode.

● Continuous Commercial Service.

▲ For tube protection, it is essential that sufficient dc resistance be used in the plate supply circuit, the grid-No.2 supply circuit, and the grid-No.1 supply circuit so that the short-circuit current is limited to 0.5 ampere in each circuit.

\* Duty Factor for the 3E29 is defined as the "on" time in microseconds divided by 1200 microseconds.

"On" Time is defined as the sum of the durations of all the individual pulses which occur during any 1200-microsecond interval.

Pulse Duration is defined as the time interval between the two points on the pulse at which the instantaneous value is 70% of the peak value. The peak value is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.

§ Averaged over any interval not exceeding 1200 microseconds. Care should be used in determining the plate dissipation. A calculated value based on rectangular pulses can be considerably in error when the actual pulses have a finite rise and fall time. Plate dissipation should preferably be determined by measuring the bulb temperature under actual operating conditions; then, with the tube in the same socket and under the same ambient-temperature conditions, apply to the tube sufficient dc input to obtain the same bulb temperature. This value of dc input is a measure of the plate dissipation.

→ Indicates a change

MAY 3, 1954

TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

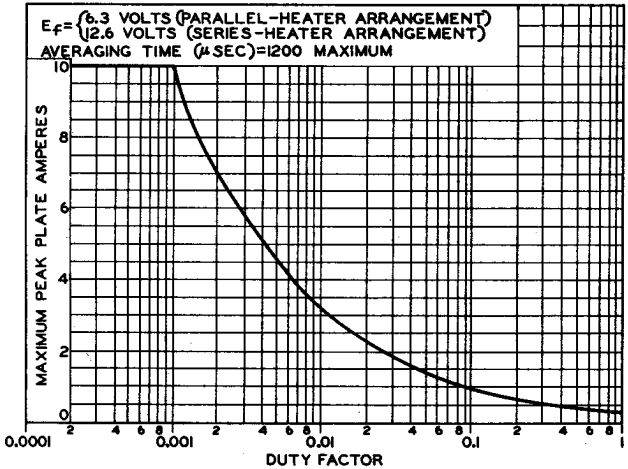
DATA 1



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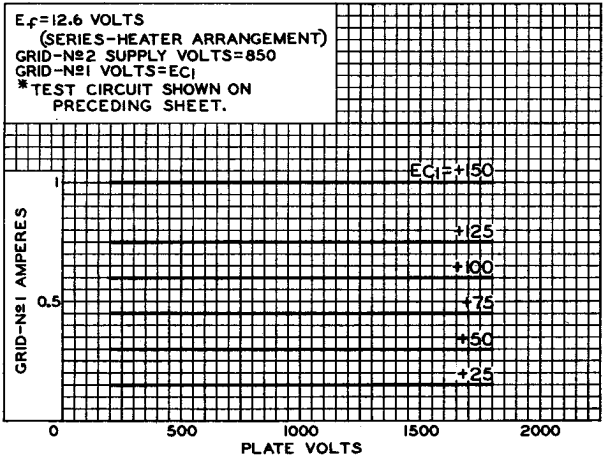
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### RATING CHART



92CS-7927R1

### AVERAGE CHARACTERISTICS UNITS IN PARALLEL IN TEST CIRCUIT \*



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### AVERAGE CHARACTERISTICS UNITS IN PARALLEL IN TEST CIRCUIT\*

$E_f = 12.6$  VOLTS (SERIES-HEATER ARRANGEMENT)

GRID-N $\circ$ 2 SUPPLY VOLTS = 850

GRID-N $\circ$ 1 VOLTS =  $E_{c1}$

\* TEST CIRCUIT SHOWN ON PRECEDING SHEET.

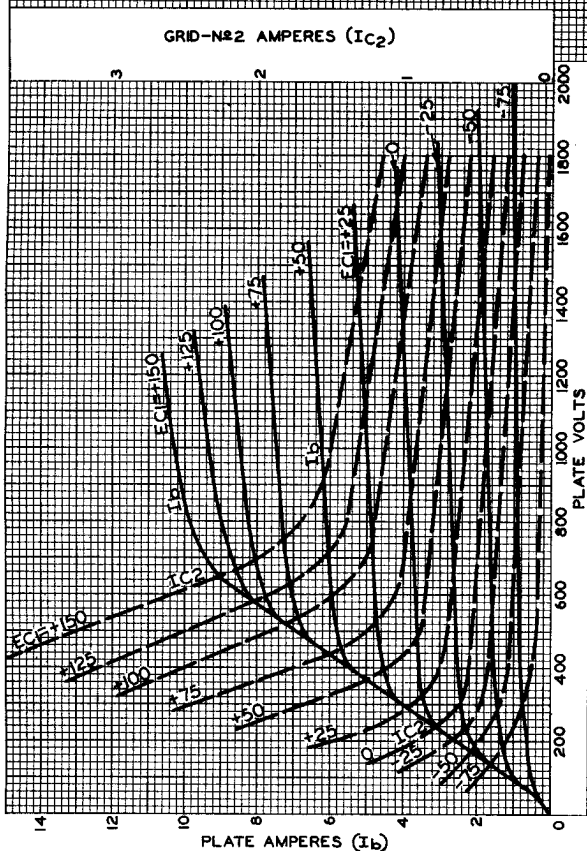




Plate Current:			
Peak . . . . .	5	10	amp
DC . . . . .	0.010	0.010	amp
DC Grid-No.2 Current . . . . .	0.0011	0.002	amp
DC Grid-No.1 Current . . . . .	0.001	0.001	amp
Load Resistance . . . . .	300	400	ohms

### CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	<i>Note</i>	<i>Min.</i>	<i>Max.</i>	
Heater Current (Parallel connection) . . . . .	1	2.00	2.50	amp
Heater Current (Series connection) . . . . .	2	1.00	1.25	amp
Grid-No.1-to-Plate Capacitance (Each unit) . . . . .	3	-	0.12	$\mu$ f
Input Capacitance (Each unit) . . . . .	-	12.8	16.2	$\mu$ f
Output Capacitance (Each unit) . . . . .	-	5.25	8.75	$\mu$ f
Plate Current (Each unit) . . . . .	1,4	38	82	ma
Grid-No.1 Voltage . . . . .	1,5	-	-55	volts
Grid-No.2 Current (Each unit) . . . . .	1,4	-	10	ma
Peak Plate Current . . . . .	1,6	9	-	amp

Note 1: With 6.3 volts on heater.

Note 2: With 12.6 volts on heater.

Note 3: With external shield having length of 3/4" and inside diameter of 2-3/8". Shield is placed around base end of tube and is connected to cathode.

Note 4: With dc plate voltage of 250 volts, dc grid-No.2 voltage of 175 volts, and dc grid-No.1 voltage of -11 volts. Grid No.1 of unit not under test is biased -100 volts with respect to its cathode.

Note 5: With units in parallel, dc plate voltage of 400 volts, dc grid-No.2 voltage of 225 volts, and dc grid-No.1 voltage adjusted to give dc plate current of 200 microamperes.

Note 6: With the units in parallel in the accompanying test circuit under the following conditions: rectangular-wave modulation applied to grid No.1; pulse duration of 1 microsecond approx; pulse repetition rate of 1500 cps approx; dc plate-supply voltage of 5000 volts; dc grid-No.2 voltage of 850 volts; dc grid-No.1 volts of -225 volts; peak positive grid-No.1 swing of 150 volts; and dc plate current of 15 ma. minimum obtained by adjusting the pulse repetition rate.

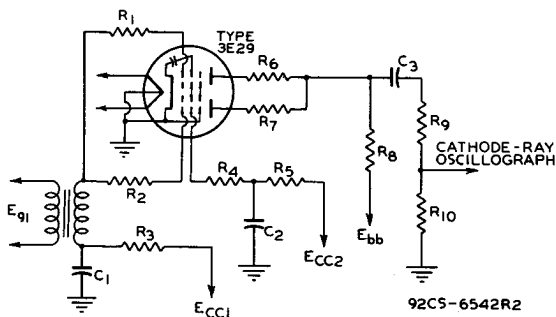
### DIMENSIONAL OUTLINE

shown under Type 829B also applies to the 3E29

← Indicates a change.



## TEST CIRCUIT



R1 R2: 20 ohms, 1 watt non-inductive  
 R3: 15000 ohms, 1 watt  
 R4: 25 ohms, 1 watt, non-inductive  
 R5: 10000 ohms, 1 watt  
 R6 R7: 10 ohms, 5 watts, non-inductive  
 R8: 10000 ohms, 50 watts  
 R9: 400  $\pm$  5% ohms, 50 watts non-inductive

R10: 10  $\pm$  1% ohms, 5 watts  
 C1: 0.1  $\mu$ f, 600 v dc  
 C2: 0.1  $\mu$ f, 1000 v dc  
 C3: 0.1  $\mu$ f, 5000 v dc  
 Ecc1: Grid-No.1 Supply Voltage  
 Ecc2: Grid-No.2 Supply Voltage  
 Ebb: Plate Supply Voltage  
 Eg1: Signal Voltage

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