RAYTHEON

TECHNICAL INFORMATION SERVICE

Technical Information

4CN15A

CERAMIC TETRODE RF POWER AMPLIFIER OR OSCILLATOR

Raytheon tube type 4CN15A is a power tetrode of metal–ceramic construction with external anode and is designed for use in low–duty pulse applications. Although the plate dissipation rating is 15 watts, this may be increased by immersion in liquid coolant, or other suitable heat sinks. Electrically similar to type 4CX300A, the 4CN15A is ideal for applications where severe environmental stresses of vibration and shock are required and where size and weight are important.

Useful operation up to 500 megacycles is provided in Class C, RF power amplifier or oscillator, plate modulated RF amplifier, and Class AB1, RF Linear Power Amplifier – Single Sideband applications.

ELECTRICAL DATA

GENERAL:

	Min.	Nom.	Max.
Seal Temperature, Maximum			250 °C
Anode–Core Temperature, Maximum			250 °C
Altitude			10000 ft.
Immersed in Coolant (e.g. FC–75)			35000 ft.
Maximum Frequency for full ratings (Note 1)			500 Mc
Cathode Heating Time	30	60	-- Seconds
Amplification Factor (G1 to G2)	4.0	4.8	5.6
Transconductance (Ib = 200 mAdc)		12000	0 = μ

HEATER CHARACTERISTICS:

Heater Voltage (Notes 1 and 2)	6.0 Volts
Heater Current	2.85 Amps

DIRECT INTERELECTRODE CAPACITANCES:

Cg–p	0.06 pf max.
Input	29.0 pf
Output	4.0 pf

CW RATINGS – ABSOLUTE MAXIMUM:

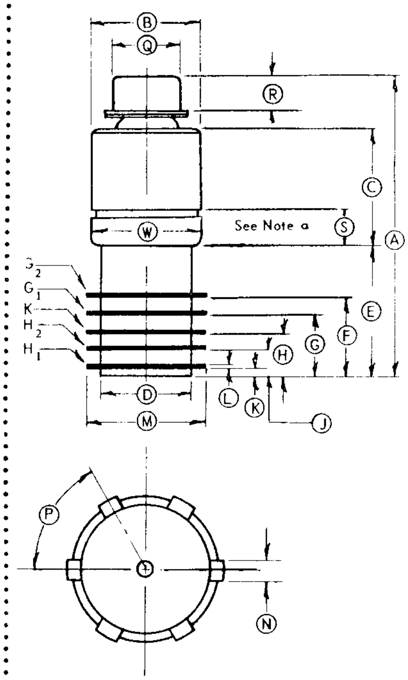
	Class C, R.F. Pwr. Amp. or Osc.	Class C Plate Mod. RF Amp.	Class ABI RF Linear Pwr. Amp.: SSB	
Heater Voltage, (Notes 1 and 2)	6.0 ± 5%	6.0 ± 5%	6.0 ± 5%	Vac
Plate Voltage	2000	1500	2500▲	Vdc
Screen Voltage	300	200	250	Vdc
Control Grid Voltage	–250	–250	---	Vdc
Plate Current	0.250	0.200	0.250	Amps
Plate Dissipation, (Note 3)	15	10	15	Watts
Screen Grid Dissipation	12	12	12	Watts
Control Grid Dissipation	2	2	2	Watts

▲ Up to 250 Mc

MECHANICAL DATA

RECOMMENDED SOCKET	Eimac SK–700 series or equivalent
WEIGHT	2.5 ozs.
OPERATING POSITION	Any
COOLING	convection or conduction
CATHODE	Coated unipotential

OUTLINE AND BASING



Note a : Do not contact this surface.

PHYSICAL DIMENSIONS
INCHES

	MIN.	MAX.
A	2.300	2.500
B	0.880 dia.	0.894 dia.
C	0.941	0.977
D	0.740 dia.	0.770 dia.
E	1.052	1.092
F	0.602	0.642
G	0.470	0.500
H	0.329	0.359
J	0.193	0.213
K	0.050	0.072
L	0.010	0.020
M	0.936 dia.	0.956 dia.
N	0.170	0.185
P	60° nom.	
Q	0.559 dia.	0.573 dia.
R	0.240	0.280
S	0.241	0.313
W	0.880	0.920

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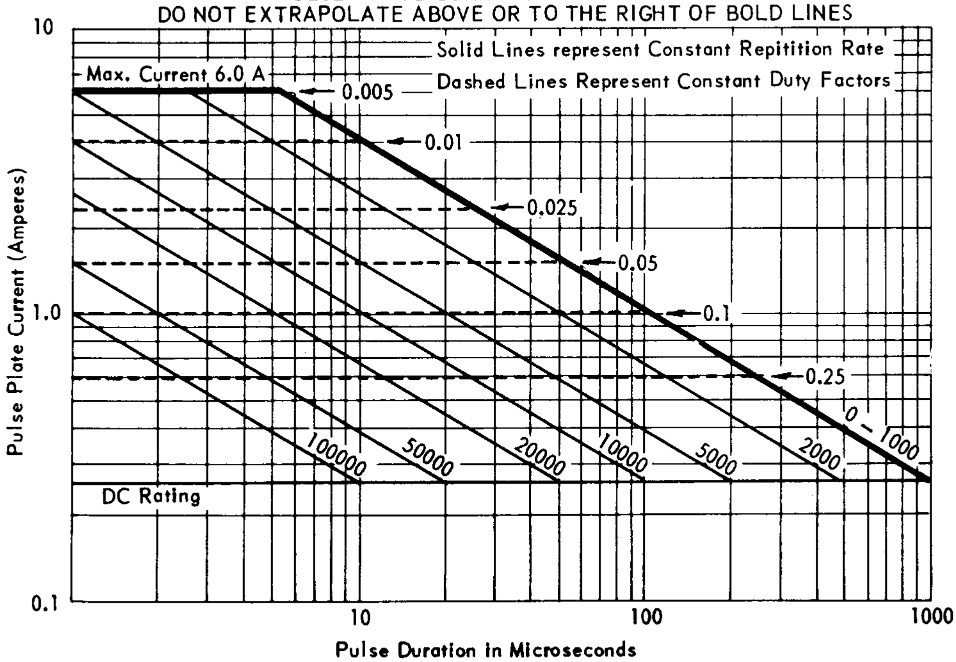
ELECTRICAL DATA (Cont'd.)

PULSE RATINGS – ABSOLUTE MAXIMUM:

	Class C Plate Pulsed	Class C Grid Pulsed	Pulse Modulator	
Heater Voltage	6.0 ± 5%	6.0 ± 5%	6.0 ± 5%	Vac
Plate Voltage (Ebb)	—	2500	3000	Vdc
Plate Voltage (eb) (pulsed)	7000	—	—	v
Grid #2 Voltage (Ec2)	—	750		Vdc
Grid #2 Voltage (ec2) (pulsed)	1500	—		v
Grid #1 Voltage (Ec1)	—	−300	−300	Vdc
Grid #1 Voltage (ec1)	−500	—	—	v
Plate Current (Ib)	—	0.250	0.250	Amp dc
Peak Plate Current (ib) (Pulse chart below)●	6.0●	—	6.0●	a
Plate Dissipation (Note 3)	15	15	15	watts
Screen Dissipation	12	12	12	watts
Grid Dissipation	2	2	2	watts
Heating time minimum	30	30	30	seconds

PULSE CHART
PULSE PLATE CURRENT vs PULSE LENGTH
DO NOT EXTRAPOLATE ABOVE OR TO THE RIGHT OF BOLD LINES



● With a pulse repetition rate (prr) of 1000 or less and a pulse duration (tp) of 5 μs or less, peak pulse current shall be limited to 6 amperes. For pulses of longer duration or higher repetition rates, peak plate current (ib) shall be reduced in accordance with the Pulse Chart.

ELECTRICAL DATA (Cont'd.)

CHARACTERISTIC RANGES AND CONTROLS:

Test Conditions, except where otherwise specified:
E_f = 6.0 Vac; Ebb = 1000 Vdc; Ec_2 = 300 Vdc; Ec1/Ib = 150 mAdc, tk = 120 sec. min.; note 2; note 3.
Values are initial, unless otherwise noted.

PRODUCTION TESTS: (Insp. Level II, 0.65% AQL individual tests, 1% all tests combined).

	MIN.	MAX.	
Screen grid current (t = 15 Max.)	−5.0	+3.0	mAdc
Grid #1 voltage (t = 15 max.)	−32.0	−45.0	Vdc
Total grid current (t = 15 max.)	---	−15.0	μAdc
Primary control grid emission			
Ic_1 = 70 mAdc, t = 15; anode and screen grid floating	---	−25.0	μAdc
Primary screen grid emission			
Ec_1 = 0 Vdc; Ic_2 = 100 mAdc; t = 15; anode floating	---	−250	μAdc
Heater current	2.60	3.10	Aac
Pulse emission (1)			
Eb = Ec_2 = 250 Vdc; Ec_1 = −100 Vdc; egk/ik = 1.5a			
Ef = 5.4 Vac; prr = 11 ± 1 cps; tp = 4,500 μsec.			
Δik (from leading edge to trailing edge) shall not exceed	---	200	ma
Positive grid current division			
Eb = Ec_2 = 250 Vdc; Ec_1 = −100 Vdc; egk/Ib = 1.0a;			
prr = 11 ± 1 cps; tp = 4500 μsec.			
egk	+8.0	+18.0	v
Ic1	---	250	ma
Ic2	---	250	ma

DESIGN TESTS: (Lot Sampling, Insp. Level L 6, 6.5% AQL)

	MIN.	MAX.	
Direct Interelectrode capacitance			
Grid to plate (max.)	---	0.06	pf
Input	25.0	33.0	pf
Output	3.5	4.5	pf
Heater–cathode leakage (Ehk = ± 250 Vdc)	---	150	μAdc
Pulse emission (2), Same as Pulse Emission (1) except Ef = 6.0 Vac: Δik	---	100	ma

APPLICATION NOTES

Note 1. At frequencies above approximately 200 megacycles it may be necessary to reduce heater voltage to compensate for rf transit time heating of the cathode after dynamic operation of the tube has started. This back heating is a function of frequency, grid current, grid bias, anode current, duty cycle, and circuit design and adjustment. Particular care should be used in the selection of stable circuit components and in final tuning of high–frequency circuits, as off–resonance operation, even to a small degree, may result in a marked and undesirable increase in cathode temperature. There is an optimum heater voltage which will maintain the cathode at the correct operating temperature for any particular set of operating conditions. A maximum variation of ± 5 per cent from optimum is permitted. For straight through, Class C CW amplifier operation, the following heater operation voltages are indicated:

Frequency (Mc)	Ef (Vac)
201 to 300	5.75
301 to 400	5.50
401 to 500	5.00

Note 2. In all electrical tests involving application of heater voltage, sufficient cooling shall be allowed to prevent operation in excess of the specified maximum seal and anode core temperature.

Note 3. For natural air (convection) cooling of the tube, with air at 25°C at sea level, anode dissipation shall be limited to 15 watts. With the anode mounted in a properly designed heat sink, or immersion cooled, anode dissipation, not to exceed 300 watts is normally limited only by allowable temperature rise for the seals and the anode core. In all cases of operation, sufficient cooling must be provided to prevent seal and anode core temperatures in excess of the specified maximum values. Where long life and consistent operation are factors, operation at reduced temperatures is recommended.

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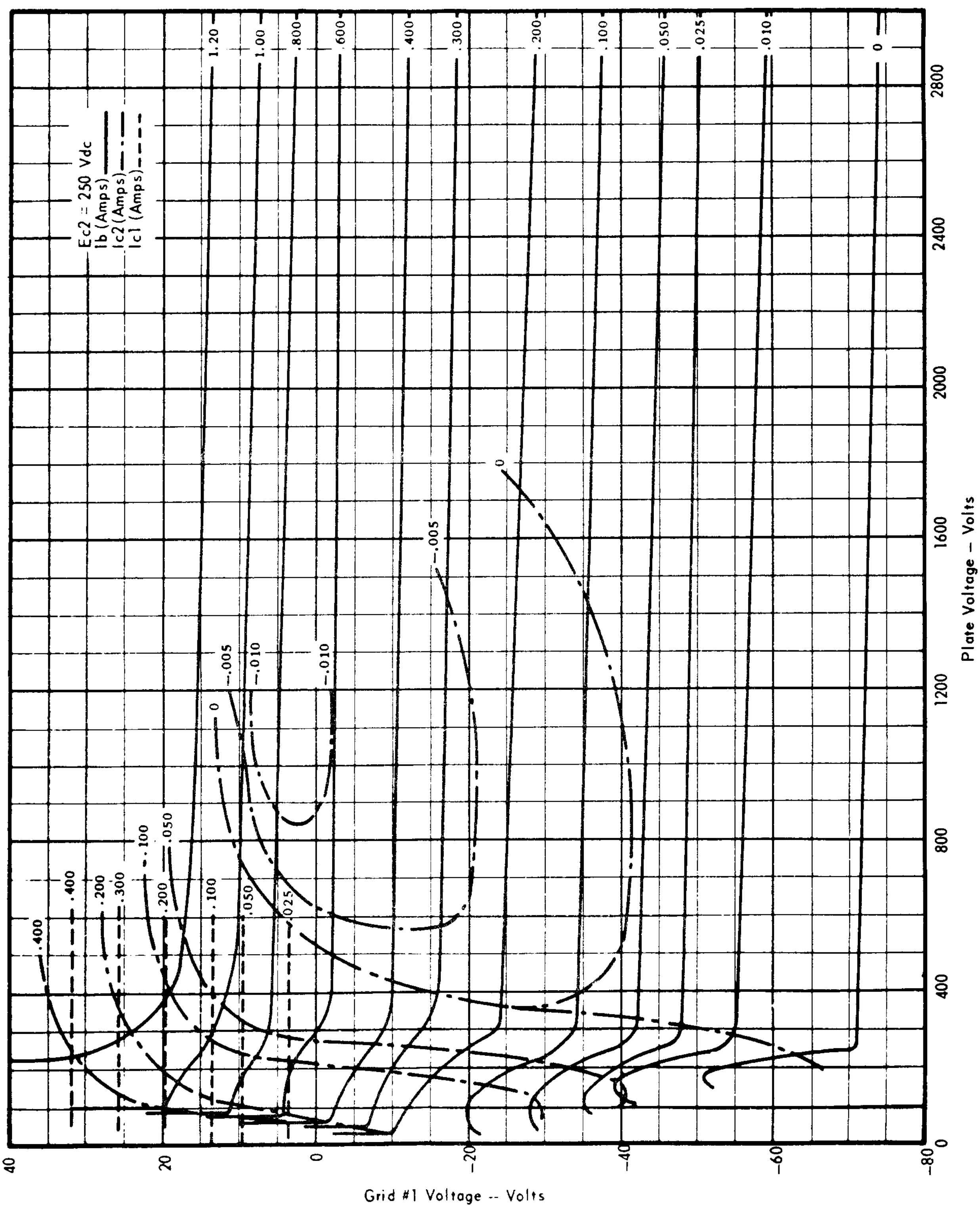
TYPICAL CONSTANT CURRENT CURVES



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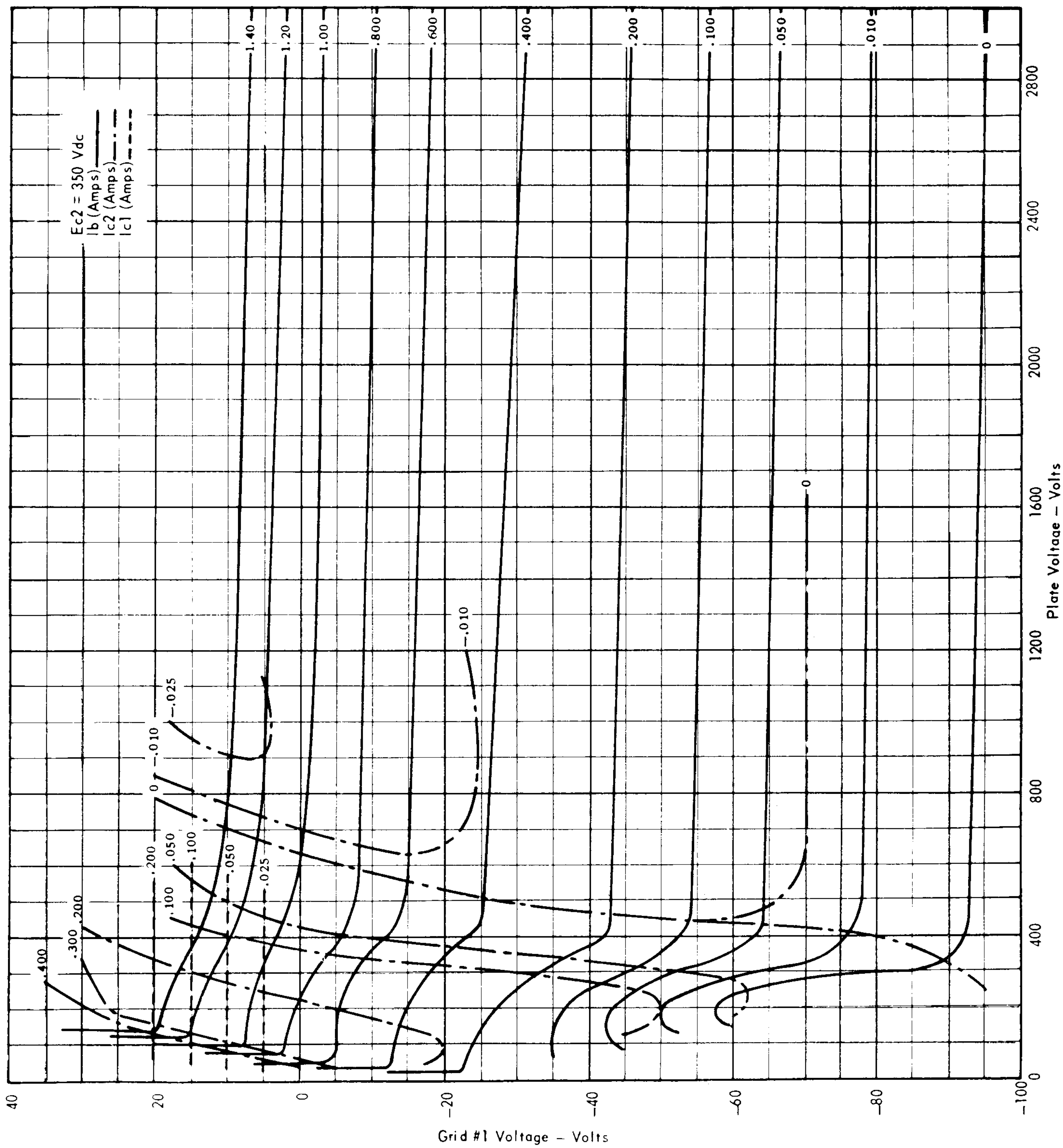

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