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engineering data service

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28D7W

MECHANICAL DATA

Bulb	T-9
Base	Lockin 8-Pin
Basing	8BS
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS

Shock (Intermittent Service-Abs. Max.)	350	g
Vibration (Continuous Service-Design Center)	2.5	g
Mechanical Resonance	None Below 100	cps

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage (Avg.)	28	Volts
Heater Voltage (Abs. Max.)	30	Volts
Heater Voltage (Design Center)	28	Volts
Heater Current (Avg.)	400	Ma
Heater Current (Max.)[1]	435	Ma
Heater Current (Min.)[1]	365	Ma

RATINGS (Each Section)

	Absolute Max.	Design Center	
Plate Voltage	100	100	Volts
Screen Voltage	67.5	67.5	Volts
Plate Dissipation	3.0	3.0	Watts
Screen Dissipation	0.5	0.5	Watt
Heater-Cathode Voltage	100	90	Volts

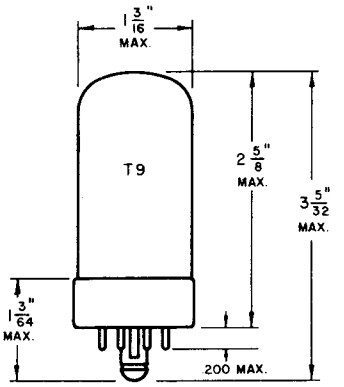
CHARACTERISTICS AND TYPICAL OPERATION

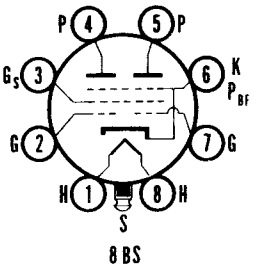
Resistance Coupled Class A_2 Amplifier (Each Section)[2]

	Self Bias	Fixed Bias			
		Min.[1]	Avg.	Max.[1]	
Plate Voltage[3]	28.0	—	28.0	—	Volts
Screen Voltage	28.0	—	28.0	—	Volts
Grid Voltage	—	—	-3.5	—	Volts
Cathode Bias Resistor	390	—	—	—	Ohms
Plate Current (Zero Signal)	9.0	8.0	12.5	17.5	Ma
Plate Current (Maximum Signal)	6.5	—	8.1	—	Ma
Screen Current (Zero Signal)	0.7	0.2	1.0	2.2	Ma
Screen Current (Maximum Signal)	1.6	—	1.9	—	Ma
Transconductance	—	2800	3400	4800	μmhos
Plate Resistance	—	—	4200	—	Ohms
Peak A F Signal Voltage	4.9	—	4.9	—	Volts
Control Grid Resistor	0.5	—	0.2	—	Megohm
Load Resistance	4000	—	4000	—	Ohms
Power Output	80	65	100	—	Mw
Total Harmonic Distortion	10	—	10	—	Percent
Heater-Cathode Leakage at ±100 Volts	—	—	—	150	μa
Grid Current	—	—	—	2.0	μa

QUICK REFERENCE DATA

Rugged double beam power tube designed for use in amplifiers or control devices in airplane or mobile service where the equipment is subjected to shock and vibration.





SYLVANIA ELECTRIC PRODUCTS INC.

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28D7W

Push Pull Resistance Coupled Class A_2 Amplifier (Both Sections)

	Self Bias	Fixed Bias	
Plate Voltage[3]	28.0	28.0	Volts
Screen Voltage	28.0	28.0	Volts
Grid Voltage	—	-3.5	Volts
Cathode Bias Resistor	180	—	Ohms
Plate Current (Zero Signal)	18.5	25.0	Ma
Plate Current (Maximum Signal)	14.5	19.0	Ma
Screen Current (Zero Signal)	1.2	2.0	Ma
Screen Current (Maximum Signal)	2.5	3.0	Ma
Peak A F Signal Voltage (Grid to Grid)	9.8	9.8	Volts
Control Grid Resistor (Each Section)	0.5	0.2	Megohm
Load Resistance (Plate to Plate)	6000	6000	Ohms
Total Harmonic Distortion	2.5	2.0	Percent
Power Output	175	225	Mw

Parallel Resistance Coupled Class A_2 Amplifier (Both Sections)

Plate Voltage[3]	28.0	28.0	Volts
Screen Voltage	28.0	28.0	Volts
Grid Voltage	—	-3.5	Volts
Cathode Bias Resistor	180	—	Ohms
Plate Current (Zero Signal)	18.5	25.0	Ma
Plate Current (Maximum Signal)	13.1	16.0	Ma
Screen Current (Zero Signal)	1.3	2.0	Ma
Screen Current (Maximum Signal)	2.8	3.5	Ma
Peak A F Signal Voltage	4.9	4.9	Volts
Control Grid Resistor	0.2	0.1	Megohm
Load Resistance	2000	2000	Ohms
Total Harmonic Distortion	9.5	8.0	Percent
Power Output	160	200	Mw

Push Pull Transformer Coupled Class A_2 Amplifier (Both Sections)

Plate Voltage[3]	28.0	Volts
Screen Voltage	28.0	Volts
Grid Voltage[4]	0	Volts
Cathode Bias Resistor	0	Ohms
Plate Current (Zero Signal)	64.0	Ma
Plate Current (Maximum Signal)	58.0	Ma
Screen Current (Zero Signal)	4.0	Ma
Screen Current (Maximum Signal)	17.0	Ma
Peak A F Signal Voltage (Grid to Grid)	17.8	Volts
Load Resistance (Plate to Plate)	1500	Ohms
Total Harmonic Distortion	11.0	Percent
Power Output	600	Mw

NOTES:

1. *Limits given here are the extremes which may be found in production.*
2. *When operating or testing one section only, the grid of the other section must be biased to -40 volts.*
3. *These ratings may be realized, provided the d c plate circuit resistance does not exceed 50 ohms per section.*
4. *Any unnecessary grid circuit resistance provides additional self bias and is not recommended if rated output is desired.*

CIRCUIT APPLICATION

The two sections of the Sylvania Type 28D7W tube may be operated separately, connected in parallel, or in a push-pull circuit. Two different recommended loads per section are specified, the choice depending upon whether both sections are to function as single-ended amplifiers or in push-pull.

In general, self-bias will probably be employed and under such conditions power outputs exceeding 150 milliwatts can readily be obtained from a single tube operating in push-pull from a resistance coupled driver. If a separate bias voltage supply can be provided, fixed-bias operation will furnish additional power output since it permits utilization of the total supply voltage. An increase in effective B voltage of about 3.5 volts is an important factor in low voltage operation. In some applications bias voltage may be obtained from an oscillator, thus making it unnecessary to provide a separate battery for grid bias and also permitting the use of the total plate supply voltage. The dc resistance of the output transformer plate winding should be as low as possible to minimize the voltage drop. Grid circuit resistance should also be kept close to the specified values.

Inasmuch as the plate, screen and heater supply of the equipment will be subjected to whatever voltage variations occur in the supply voltage, it is important to know how the performance will be affected by such changes. The operating supply may vary from 32 volts to as low as 22 volts.

Power output and distortion data on Type 28D7W are given in the following table with the heater, plate and screen voltages varied from 22 volts to 30 volts under fixed-bias and self-bias conditions. Values shown are for resistance coupled operation with both sections connected in parallel.

R_L = 2000 Ohms
FIXED BIAS
R_g = 100,000 Ohms, E_c = -3.5 Volts

$E_h = E_b = E_{c2}$	P. O.	% Distortion
22 Volts	112 Mw	15
24	135	12
26	170	10
28	200	8
30	235	8

E_{sig} = 3.5 Volts RMS
SELF BIAS
R_g = 200,000 Ohms, R_k = 180 Ohms, C_k = 10 μf

$E_h = E_b = E_{c2}$	P. O.	% Distortion
22 Volts	90 Mw	16
24	109	14
26	130	12
28	160	10
30	175	9

In applications where the tube is required to operate for any extended period at heater voltages in excess of 28 volts, a resistor should be inserted in series with the heater supply voltage and the heater.

Several methods of driving the Type 28D7W tube are very satisfactory for applications where a 28 volt power supply is the only source of operating voltage. Considerably higher power outputs than those mentioned previously are possible with push-pull transformer drive when another Type 28D7W is employed as a driver with both sections connected in parallel. At 500 milliwatts output the driving power is less than 45 milliwatts and the grid-to-grid signal on the output tube is approximately 10.5 volts RMS. At 600 milliwatts output these figures are 80 milliwatts and 12.8 volts respectively.

In order to make a tube providing good power output with only 28 volts plate supply, it is necessary to provide more cathode power than is customary in power output tubes. This results in a high operating temperature which should be considered in the selection of the tube socket and the placement of parts.

A special application is for supplying dc power up to 725 milliwatts at medium voltages of 50 to 250 volts and output voltages of 500 to 600 volts for lower power requirements. This is done by rectifying and filtering the voltage developed across a coil coupled to the tank circuit of the Sylvania Type 28D7W tube as a self-excited oscillator with only 28 volts supply. This may be added in series to the 28 volt source for the maximum values given or can be used as an isolated supply if required. Additional data for this service is available on request.

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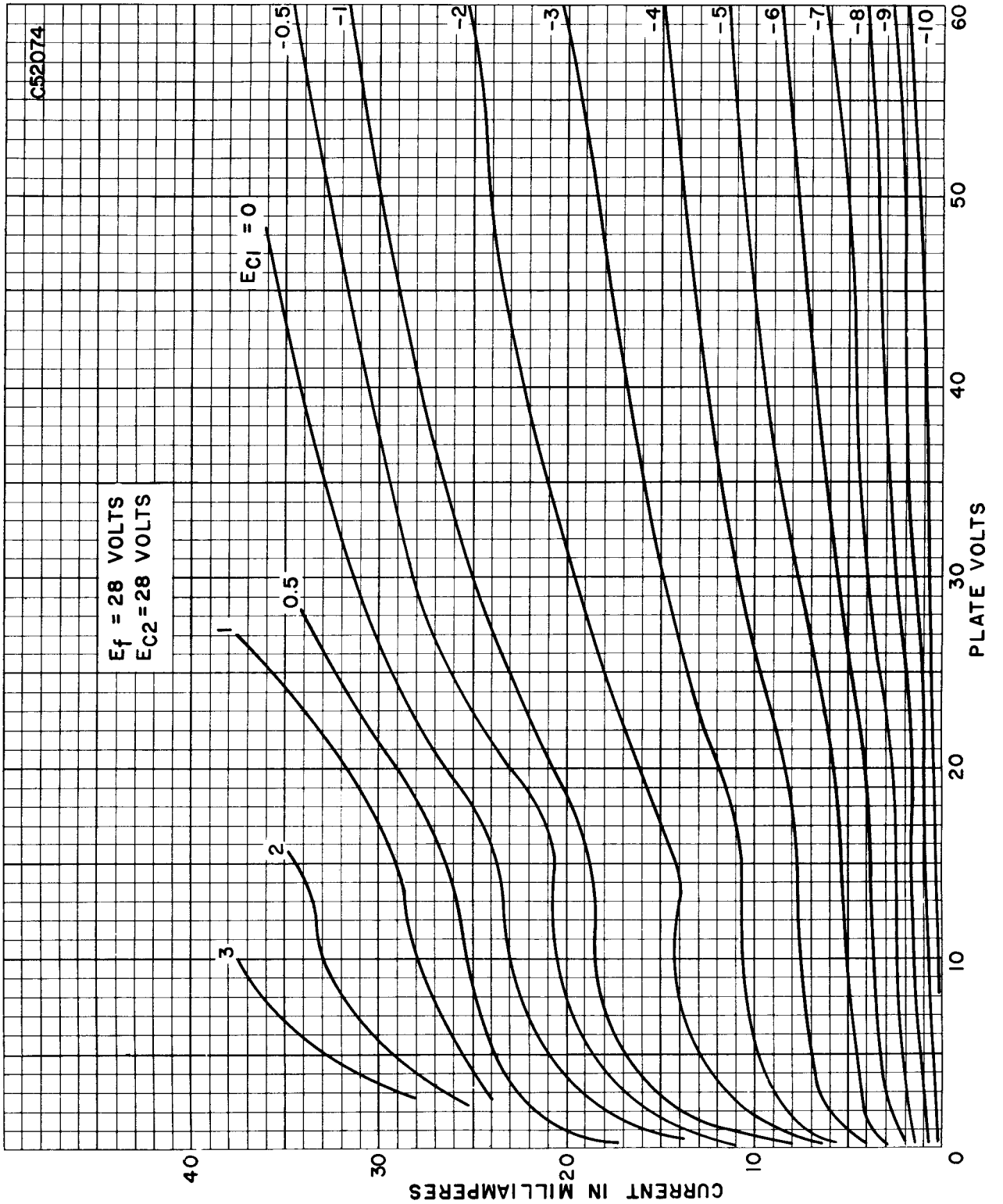
28D7W

AVERAGE PLATE CHARACTERISTICS

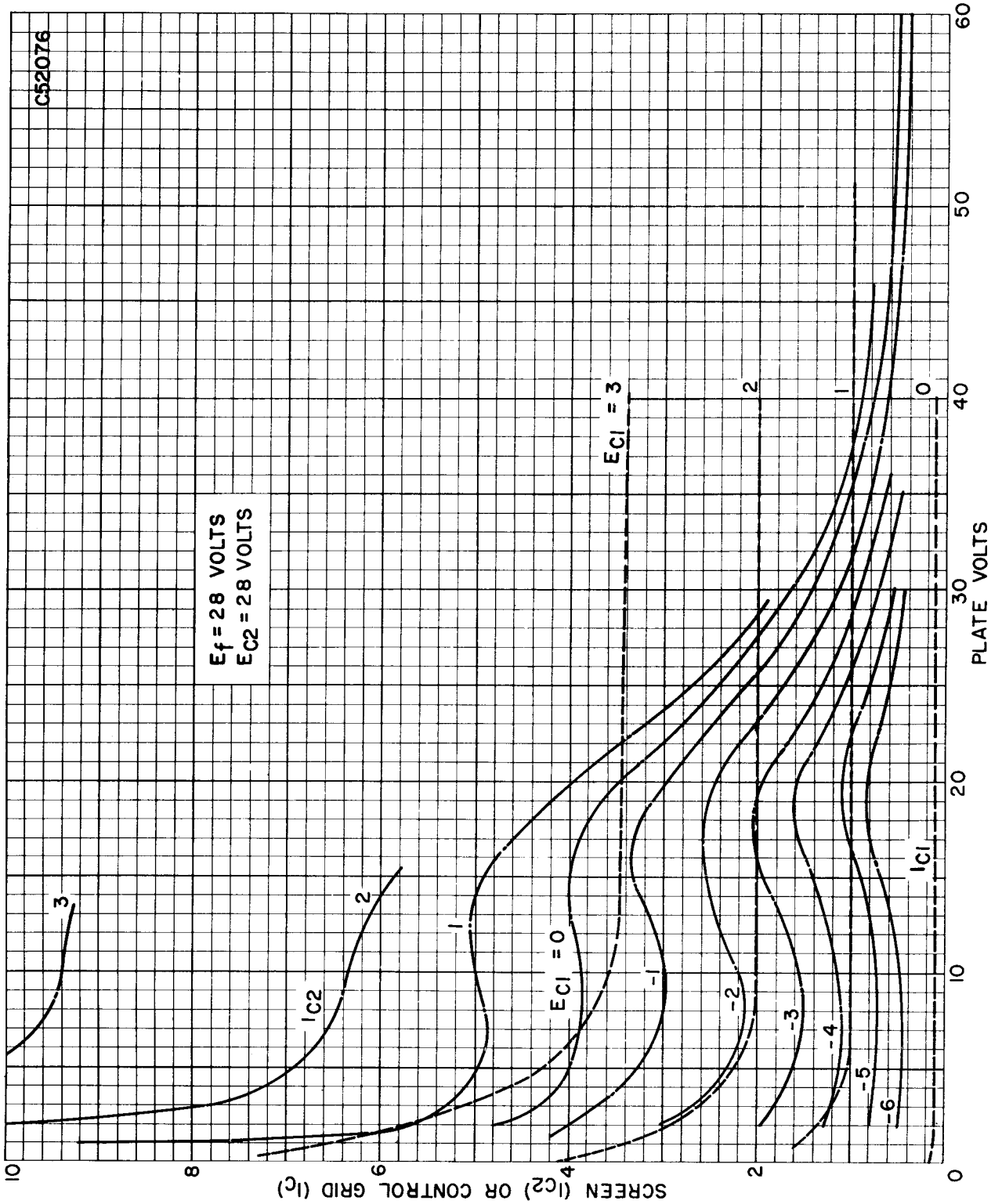
EACH SECTION



28D7W

AVERAGE CHARACTERISTICS

EACH SECTION



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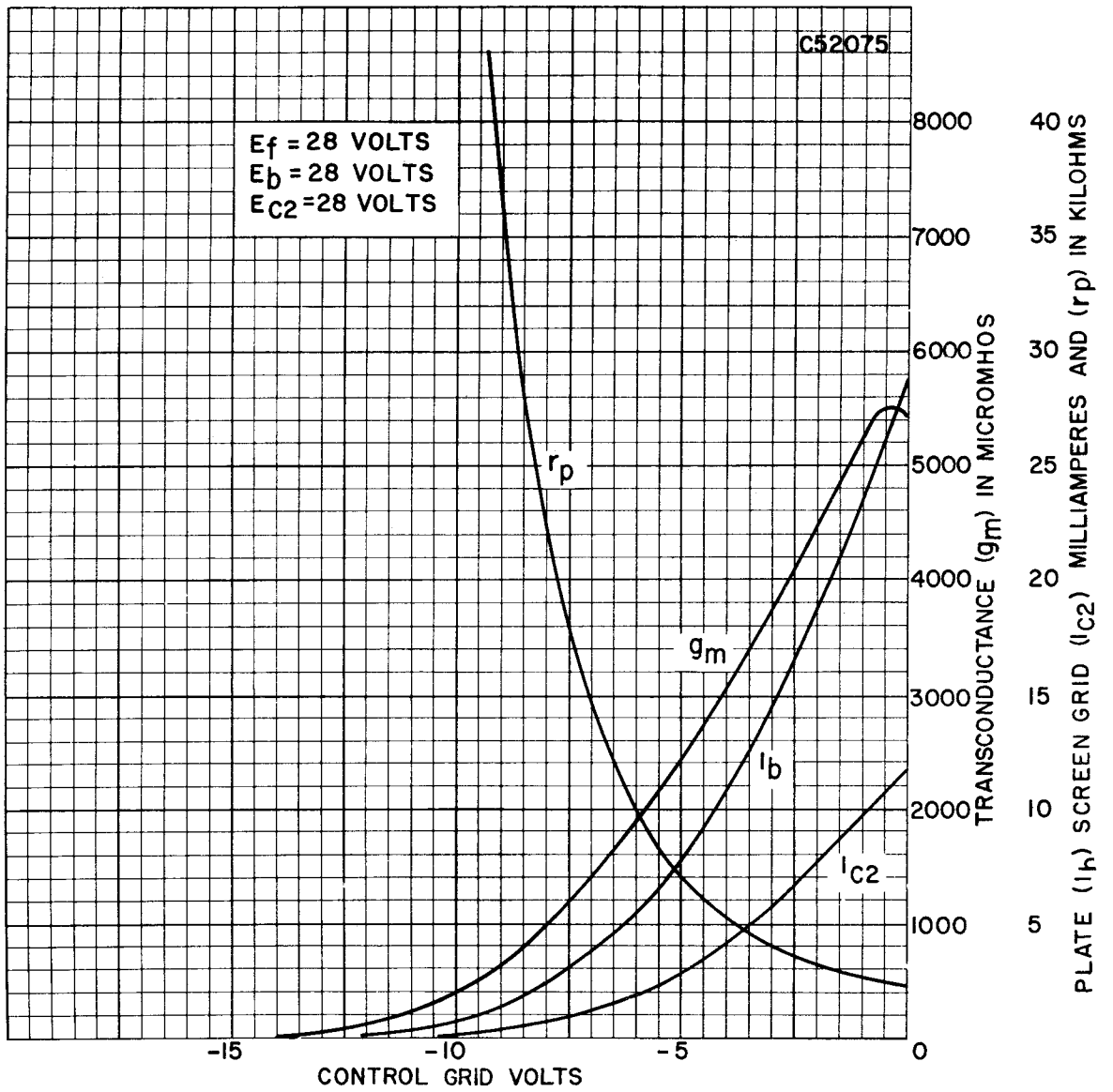
AVERAGE TRANSFER CHARACTERISTICS



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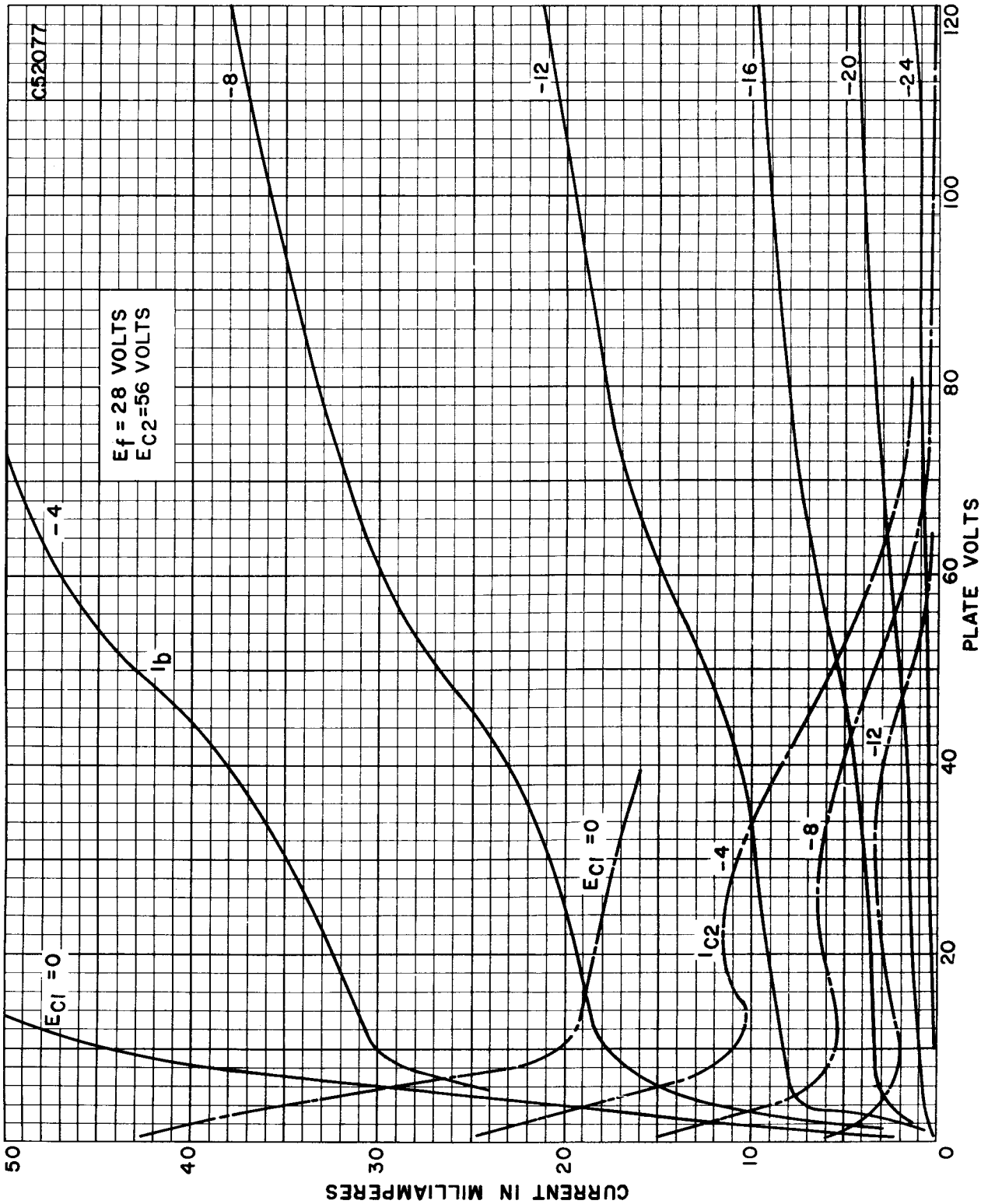
AVERAGE PLATE CHARACTERISTICS

EACH SECTION



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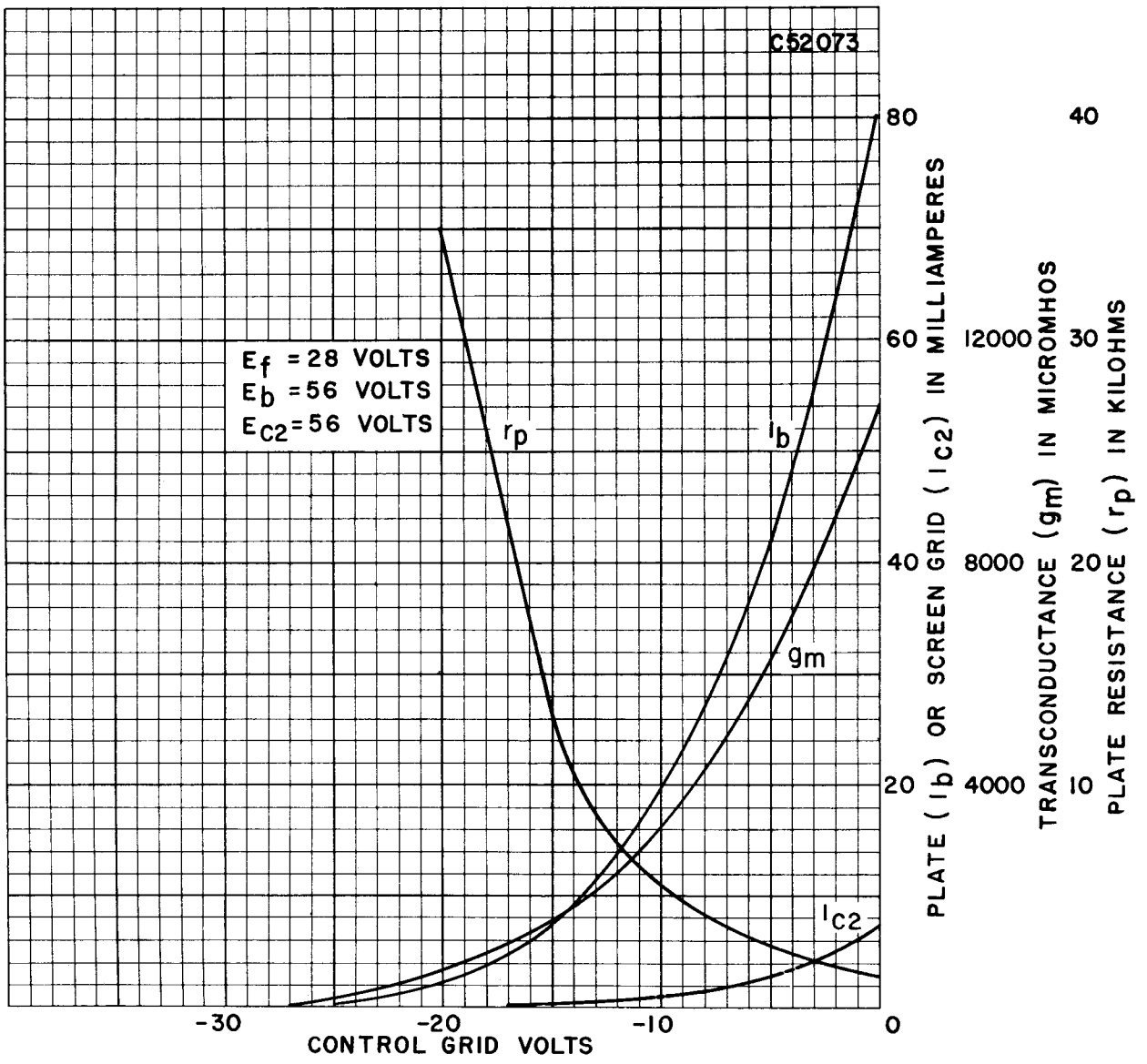
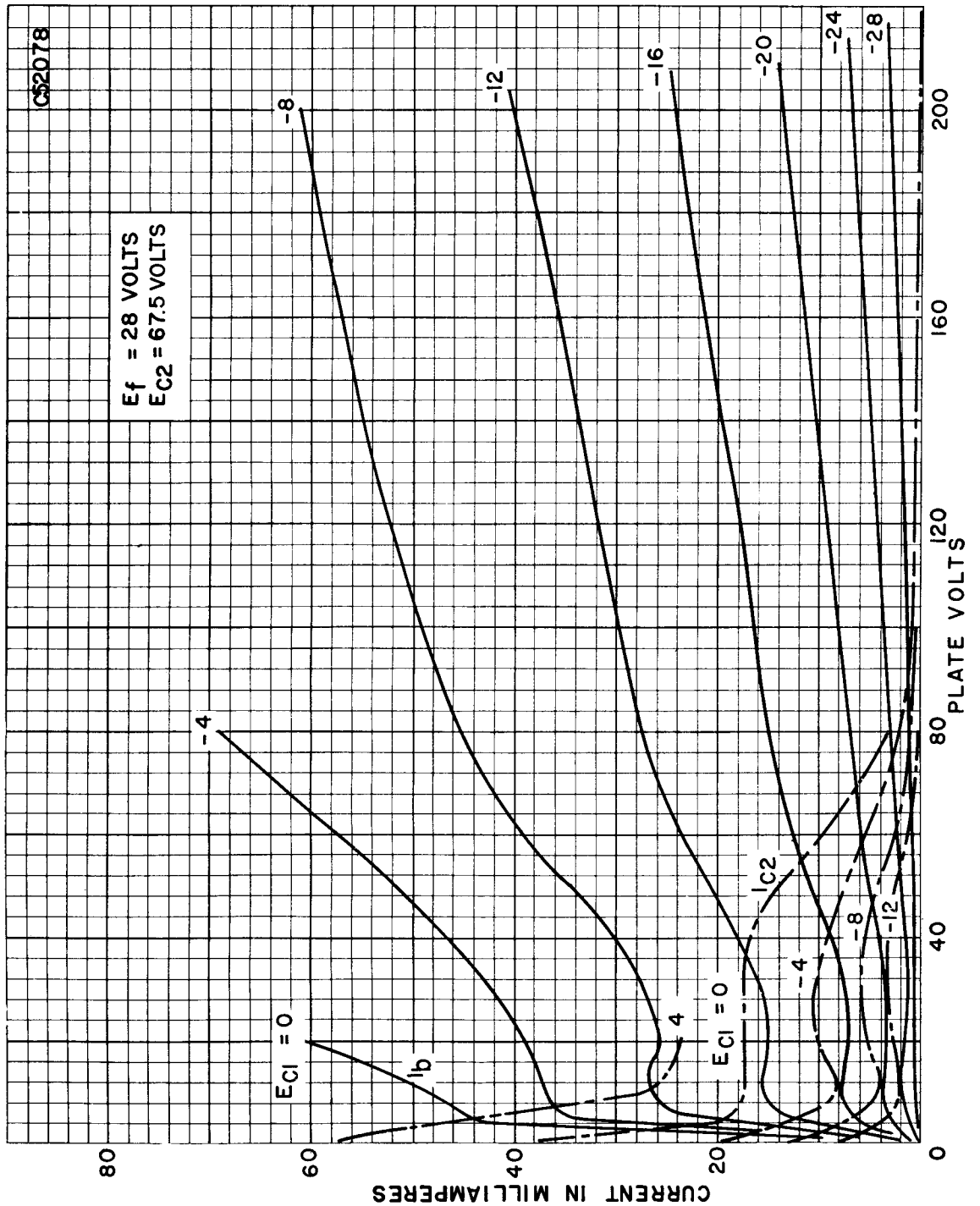
AVERAGE TRANSFER CHARACTERISTICS



28D7W

AVERAGE PLATE CHARACTERISTICS

EACH SECTION



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AVERAGE TRANSFER CHARACTERISTICS