EITEL-MCCULLOUGH, INC. SAN BRUNO, CALIFORNIA

The Eimac 450TL is a medium-mu power triode having a maximum plate dissipation rating of 450 watts, and is intended for use as an amplifier, oscillator and modulator. It can be used at its maximum ratings at frequencies as high as 40-Mc. Cooling of the 450TL is accomplished by radiation from the plate, which operates at a visible red color at maximum dissipation, and by means of air circulation around the envelope.

GENERAL CHARACTERISTICS

ELECTRICAL

Current -	 	- - 	-	- - //ded/ w	- - 	- -	7.5 2.0	volts amperes					
basing diagram). Corresponding distribution of filament and R-F cl	socket termi	nt ieaci a nals must nts.	be co	nnecter	d in pa	rallel to	provid	e proper					
Amplification Factor (Average Direct Interelectrode Capacita	nces (Averag	- e)	-	-	-	-	-	- 18				X.A	an a
Grid-Plate -		· -	•	-	-	-	-	4.5 μμf			9		
Grid-Filament Plata Filament		-	-	-	-	-	-	0.8 µµt			-		69
Transconductance (is = 500ma	$E_{\rm b} = 4000 {\rm v}$	- e. = ·			_		5000	umhos				T	
Frequency for Maximum Rat	inas		-		-			40-Mc.					
MECHANICAL													
Base		-		-	-	Special	4 pin, M	lo. 5002B				- Sec. 2	
Basing		-	-	-			RMA +	уре 4АФ					9
Mounting		-	:	-	- V Radi	ertical, ation an	base do d air c	irculation					P
Note: Adequate ventilat	ion or air co	oling mus	t be pr	rovided	so tha	t the sea	als and	envelope				- e	••
do not exceed 200°C under opera	ting conditio	ns.	•••										
Socket	Johnson	lype No.	211 or	Nation	al lype	No. XM	50 or ea	quivalent.	L	,			
Plate	g Connectors	: 		-	-	_	-		-	-		Eima	c HR-8
Grid	· _			-	-	-	-		-	-	-	Eima	c HR-8
Note: The grid terminal	of the 450TL	is now.	560'' in	diame	eter. To	accom	modate	existing	equipment	designe	d for	the old	er style
4501L having .098" diameter grid removed from the grid terminal c drawing.)	of the tube. T	n adapte he small	grid tei	s provi rminal,	aea wr if use	n me ne d, requi	wertui res an	HR-4 he	aapter pin at dissipat	ing con	ded so nector	, (See	outline
Maximum Overall Dimensions:													
Length -		-	-	-	-	-	-	-		-	-	5 12	5 inches 5 inches
Net weight		-	-	-	-	-	-	-		-	-	1.3	pounds
Shipping weight (Average)		-	-	-	-	-	-	-		-	-	5.6	pounds
AUDIO FREQUENCY PO	WER AM		R		TYPIC	AL OPER	TION-	2 TUBES					
AND MODULATOR			-		D-C F	rid Volta	age ge (app	rox.)* -		3000 110	4000	5000 240	Volts Volts
Class AB, (Sinusoidal wave, two tube	s unless otherv	ise specifi	ed)		Zero-S	ignal D-C gnal D-C	Plate C Plate	urrent - Current	: : :	200 ~ 770	150 675	620	Ma. Ma.
-					Max-Si								Ohms
MAXIMUM RATINGS			•		Max-Si Effecti Peak	ve Load,	Plate-t	o-Plate -	r tubel	. 7700	12,800	18,500	(alte
MAXIMUM RATINGS D-C PLATE VOLTAGE	6000	MAX. VOL	TS		Max-Si Effecti Peak Max-Si	ve Load, A-F Grid gnal Pea	Plate-t Input V k Drivin	o-Plate - oltage (pe g Power	r tube)	- 7700 325 40	12,800 365 33	18,500 430 56	olts Natts
MAXIMUM RATINGS D-C PLATE VOLTAGE - MAX-SIGNAL D-C PLATE CURRENT PER TUBE -	6000	MAX. VOL MAX. MA.	TS		Max-Si Effecti Peak Max-Si Max-Si Max-Si	ve Load, A-F Grid gnal Pea gnal Non gnal Plat	Plate-t Input V k Drivin hinal Dri e Power	o-Plate - oltage (pe g Power ving Power Output	r tube) {approx.}	- 7700 325 40 20 1400	12,800 365 33 17 1800	18,500 430 56 28 2200	Volts Natts Natts Natts
MAXIMUM RATINGS D-C PLATE VOLTAGE MAX-SIGNAL D-C PLATE CURRENT PER TUBE PLATE DISSIPATION, PER TUBE	6000 600 - 450	MAX. VOL MAX. MA. MAX. WA ⁻	TS FTS		Max-Si Effecti Peak Max-Si Max-Si Max-Si Max-Si *Adjus	ve Load, A-F Grid gnal Pea gnal Non gnal Plat t to give	Plate-t Input V k Drivin hinal Dri e Power stated z	o-Plate - oltage (pe g Power ving Power output ero-signal	r tube) - (approx.) plate current	- 7700 325 40 20 1400	12,800 365 33 17 1800	18,500 430 56 28 2200	Volts Watts Watts Watts
MAXIMUM RATINGS D-C PLATE VOLTAGE - MAX.SIGNAL D-C PLATE CURRENT PER TUBE - PLATE DISSIPATION, PER TUBE - RADIO FREOUENCY PO	6000 600 - 450	MAX. VOL MAX. MA. MAX. WAT	rts R		Max-Si Effecti Peak Max-Si Max-Si Max-Si *Adjus	ve Load, A-F Grid gnal Pea gnal Non gnal Plat t to give AL OPERA	Plate-t Input V k Drivin ninal Dri e Power stated z	o-Plate - oltage (pe g Power ving Power Output ero-signal ER TUBE*	r tube) r (approx.) plate current	- 7700 325 40 20 1400	12,800 365 33 17 1800	18,500 430 56 28 2200	Volts Watts Watts Watts
MAXIMUM RATINGS D-C PLATE VOLTAGE MAX.SIGNAL D-C PLATE CURRENT PER TUBE PLATE DISSIPATION, PER TUBE RADIO FREQUENCY PO AND OSCILLATOR	6000 600 - 450 WER AM	MAX. VOL MAX. MA. MAX. WA PLIFIE	rts R		Max-Si Effecti Peak / Max-Si Max-Si *Adjus TYPIC/ D-C P D-C 6	ve Load, A-F Grid gnal Pea gnal Non gnal Plat t to give AL OPERA late Volt Frid Volt	Plate-t Input V k Drivin hinal Dri e Power stated z XTON, Pl age - age -	o-Plate oltage (pe g Power ving Power Output ero-signal ER TUBE*	r tube) (approx.) plate current	- 7700 325 40 20 1400 	12,800 365 33 17 1800 4000 400	18,500 430 56 28 2200 5000 5000	Volts Watts Watts Watts Volts Volts
MAXIMUM RATINGS D-C PLATE VOLTAGE MAX.SIGNAL D-C PLATE CURRENT PER TUBE PLATE DISSIPATION, PER TUBE RADIO FREQUENCY PO AND OSCILLATOR	6000 - 600 - 450 WER AM	MAX. VOL MAX. MA. MAX. WA PLIFIE	rts R		Max-Si Effecti Peak Max-Si Max-Si Max-Si *Adjus TYPIC D-C P D-C P D-C F D-C F	ve Load, A-F Grid gnal Pea gnal Non gnal Plat t to give AL OPERA late Volt Prid Volt late Curr	Plate-t Input V k Drivin ninal Dri e Power stated z 	o-Plate oltage (pe g Power ving Power Output ero-signal ER TUBE*	r tube) {approx.} plate current	- 7700 325 40 20 1400 	4000 4000 450 53	18,500 430 56 28 2200 5000 5000 450 54	Volts Watts Watts Watts Volts Volts Ma. Ma.
MAXIMUM RATINGS D-C PLATE VOLTAGE MAX-SIGNAL D-C PLATE CURRENT PER TUBE PLATE DISSIPATION, PER TUBE RADIO FREQUENCY PO AND OSCILLATOR Class-C Telegraphy or FM Telephony (1)	6000 600 - 450 /WER AM	MAX, VOL MAX, MA, MAX, WA PLIFIE tions, per	tube).		Max-Si Effectii Peak Max-Si Max-Si Max-Si *Adjus TYPIC D-C D-C Peak Peak Peak Peak	ve Load, A-F Grid gnal Pea gnal Non gnal Plat t to give AL OPERA Viate Volt. Grid Volt. Grid Curr C-F Grid Curr	Plate-t Input V k Drivin ninal Dri e Power stated z TON, Pl age - age - rent - ent - onput Vo	o-Plate oltage (pe g Power ving Power Output ero-signal ER TUBE*	r tube) (approx.) plate current	- 7700 325 40 20 1400 	4000 4000 4000 453 740 450 53 740	18,500 430 56 28 2200 5000 5000 5000 450 54 870 54 870	Volts Watts Watts Watts Volts Volts Ma. Volts Ma. Volts
MAXIMUM RATINGS D-C PLATE VOLTAGE MAX-SIGNAL D-C PLATE CURRENT PER TUBE PLATE DISSIPATION, PER TUBE RADIO FREQUENCY PO AND OSCILLATOR Class-C Talegraphy or FM Telephony (I MAXIMUM RATINGS	6000 600 450 WER AM	MAX, VOL MAX, MA, MAX, WA PLIFIE tions, per	tube).		Max-Si Effecti Peak / Max-Si Max-Si *Adjus TYPIC/ D-C P D-C P D-C F D-C F D-C F D-C F C Peak F Driving Grid I	ve Load, A-F Grid gnal Pea gnal Non gnal Plat t to give AL OPERA late Volt Srid Volt, Grid Curr Grid Curr Grid Curr Grid Curr Grid Curr Grid Curr	Plate-t Input V k Drivin inal Dri e Power stated z TON, Pl age age rent ent input Vo approx.)	o-Plate oltage (pe g Power Ving Power Output ero-signal ER TUBE*	r tube) (approx.) plate current	- 7700 325 40 20 1400 3000 	4000 4000 4000 453 740 35 13	18,500 430 56 28 2200 5000 5000 450 54 870 42 15 42 15	folts Watts Watts Watts folts folts Ma, Ma, folts Watts Watts
MAXIMUM RATINGS D-C PLATE VOLTAGE MAX.SIGNAL D-C PLATE CURRENT PER TUBE PLATE DISSIPATION, PER TUBE RADIO FREQUENCY PO AND OSCILLATOR Class-C Telegraphy or FM Telephony (I MAXIMUM RATINGS D-C PLATE VOLTAGE	6000 600 - 450 WER AM Key-down condi 6000	MAX. VOL MAX. MA. MAX. WA PLIFIE tions, per MAX. VOL	TS TTS R tube). TS		Max-Si Effecti Peak / Max-Si Max-Si Max-Si *Adjus D-C F D-C	ve Load, A-F Grid gnal Pea gnal Non gnal Plat t to give AL OPERA late Volt. Plate Curr Brid Curr Brid Curr B-F Grid I g Power (In Power In Dissipation	Plate-t Input V k Drivin inal Dri e Power stated z TTON, Pl age - rent - ent - nput Vo approx.}	o-Plate oltage (pe g Power ving Power Output ero-signal ER TUBE*	r tube) (approx.) plate current	- 7700 325 40 20 1400 	4000 4000 450 53 740 35 13 1800	18,500 430 560 28 2200 5000 5000 5000 540 544 870 42 250 2250 450	folts Watts Watts Watts folts folts Ma. folts Watts Watts Watts Watts Watts
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MAXIMUM RATINGS D-C PLATE VOLTAGE - MAX.SIGNAL D-C PLATE CURRENT PER TUBE - C PLATE CURRENT PER TUBE - C PLATE CURRENT PLATE DISSIPATION, PER TUBE - RADIO FREQUENCY PO AND OSCILLATOR Class-C Telegraphy or FM Telephony (MAXIMUM RATINGS D-C PLATE CURRENT - PLATE DISSIPATION PLATE MODULATED RA AMPLIFIER Class-C Telephony (Carrier conditions, MAXIMUM RATINGS	6000 - 600 - 450 - 450 6000 6000 600 650 65 ADIO FRE per tube)	MAX, VOL MAX, MA, MAX, WA PLIFIE tions, per MAX, VOL MAX, WA MAX, WA QUEN(rts R tube). ts trs CY		Max-Si Effective Peak / Max-Si Max-Si Max-Si Max-Si *Adjus D-C F D-C F D-C C D-C C D-C D-C D-C D-C D-C D-C D-C D-C D-	Yes Load, A-F Grid gnal Pea gnal Non gnal Non gnal Non gnal Plat t to give AL OPERA late Volt brid Volt late Volt brid Volt late Volt Grid Volt late Volt Grid Volt late Volt Grid Volt late Volt Grid Volt late Curr Bissipation Power (D Jissipation Power (D Jissipation Power (D Jissipation Power (D Jissipation Forder Volt Bias Volt Resistor Frid Volt Power -F Grid I Power	Plate-t Input V k Drivin inal Dri e Power stated z TTON, Pl age ent ent put - put - put - put - - - - - - - - - - - - -	o-Plate oltage (pe g Power Output ero-signal ER TUBE* 	r tube) (approx.) plate current d tube per	- 7705 3000 300 	12,800 3455 33 17 1800 4000 450 53 740 35 13 1900 1350 340 1350 340 1350 340 0 500 500 500 36 790 36 790 36	18,500 430 56 228 228 228 228 228 228 228 450 450 450 450 18 2250 450 450 450 18 2250 450 450 450 54 54 55 55 55 55 55 55 55 55	folts Watts Watts Watts Watts Watts Wa Ma. Va. Va. Vats Watts Watts Watts Watts Watts Watts Watts Watts Watts Watts Olts Olts Johns Aa. Yat. Yats Wats Wats Wats Wats
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MAXIMUM RATINGS D-C PLATE VOLTAGE - MAX.SIGNAL D-C PLATE CURRENT PER TUBE - C PLATE CURRENT PER TUBE - PLATE DISSIPATION, PER TUBE - RADIO FREQUENCY PO AND OSCILLATOR Class-C Telegraphy or FM Telephony (MAXIMUM RATINGS D-C PLATE VOLTAGE PLATE DISSIPATION PLATE MODULATED RA AMPLIFIER Class-C Telephony (Carrier conditions, MAXIMUM RATINGS D-C PLATE VOLTAGE D-C PLATE VOLTAGE D-C PLATE CURRENT	6000 600 600 6000 6000 600 650 ADIO FRE per tube) 4500 4500 500	MAX. VOL MAX. MA. MAX. WA PLIFIE tions, per MAX. VOL MAX. WA QUENT MAX. VOL MAX. VOL MAX. MA.	rts R tube). TS TTS CY		Max-si Effective Peak / Max-Si Max-Si Max-Si Max-Si Max-Si Adjust D-C P D-C & D-C & D-C & Po- D-C & Po- Po- D-C & Po- Po- D-C & Po- Po- Po- Po- Po- Po- Po- Po-	ve Load, A-F Grid gnal Pea gnal Non gnal Non gnal Non gnal Plat t to give AL OPERA late Volta- brid Volta late Volta- brid Curr L-F Grid U losses. AL OPERA ate Volta- brissipation Power (D) Dissipation Power (D) lass Volta Bias Volta Bias Volta Bias Volta Bias Volta Bias Volta Dissipation Power (D) I Power J Power (D) J P Pow	Plate-t Input V k Drivin inal Dri e Power stated z TTON, Pl age ent input Vo approx.) put trion, I put age ent age ent age ent put put - put - - - - - - - - - - - - -	o-Plate oltage (pe g Power Output ero-signal ER TUBE* 	d tube per	- 7705 3000 300 	12,800 365 333 17 1800 4000 4000 4000 450 533 1800 450 533 1800 450 533 1800 450 533 1800 450 533 1800 450 533 17 1800 450 533 17 1800 450 533 17 1800 450 533 17 1800 450 133 1800 450 133 1800 450 133 1800 450 133 1800 450 133 1800 450 133 1800 450 135 135 1800 450 135 1800 450 135 1800 450 135 1800 450 135 1800 450 135 1800 450 135 1800 4000 1800 1	18,500 430 5500 5000	folts Watts Watts Watts Watts Volts Wats Via. Via. Via. Via. Via. Via. Via. Via.
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Indicates change from sheet dated 9-1-44.



MEDIUM-MU TRIODE

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APPLICATION

MECHANICAL

Mounting—The 450TL must be mounted vertically, base up or base down. Flexible connecting straps should be provided from the grid and plate terminals to the external grid and plate circuits. The tube must be protected from severe vibration and shock.

Cooling—Provision should be made for ample circulation of air around the 450TL. In the event that the design of the equipment restricts natural circulation, the use of a small fan or centrifugal blower to provide additional cooling for the tube will aid in obtaining maximum tube life. Special heat-dissipating connectors (Eimac HR-8) are available for use on the plate and grid terminals. These connectors help to prolong tube life by reducing the temperature of the seals.

ELECTRICAL

Filament Voltage—For maximum tube life the filament voltage, as measured directly at the filament pins, should be the rated value of 7.5 volts. Unavoidable variations in filament voltage must be kept within the range from 7.03 to 7.88 volts. All four socket terminals should be used, putting two in parallel for each filament connection.

Bias Voltage—Although there is no maximum limit on the bias voltage which may be used on the 450TL, there is little advantage in using bias voltages in excess of those given under "Typical Operation," except in certain very specialized applications. Where bias is obtained by a grid leak, suitable protective means must be provided to prevent excessive plate dissipation in the event of loss of excitation. **Grid Dissipation**—The power dissipated by the grid of the 450TL must not exceed 65 watts. Grid dissipation may be calculated from the following expression:

 $\begin{array}{c} P_{g} = e_{cmp}I_{c} \\ \text{where } P_{g} = \text{Grid dissipation} \\ e_{cmp} = \text{Peak positive grid voltage, and} \\ I_{c} = D\text{-}c \text{ grid current.} \end{array}$

 $e_{\rm cmp}$ may be measured by means of a suitable peak voltmeter connected between filament and grid.¹ In equipment in which the plate loading varies widely, such as oscillators used for radio-frequency heating, care should be taken to make certain that the grid dissipation does not exceed the maximum rating under any conditions of loading.

Plate Voltage—Except in very special applications, the plate supply voltage for the 450TL should not exceed 6000 volts. In most cases there is little advantage in using plate-supply voltages higher than those given under "Typical Operation" for the power output desired. Plate Dissipation—Under normal operating conditions, the power dissipated by the plate of the 450TL should not be allowed to exceed 450 watts. At this dissipation the brightness temperature of the plate will appear a red-orange in color. The value of this color is somewhat affected by light from the filament as well as from external sources. Plate dissipation in excess of the maximum rating is permissible for short periods of time, such as during tuning procedures.

¹ For suitable peak v.t.v.m. circuits see, for instance, ''Vacuum Tube Ratings,'' **Eimac News**, January, 1945. This article is available in reprint form on request.





NOTE:—The grid terminal on the new 450TH and TL type tube is now .563" in diameter. To accommodate existing equipment which uses the 450TH or TL tubes with the old style .098" grid terminal, an adaptor pin is provided. This adaptor pin, if not needed, may be removed by unscrewing.



DRIVING POWER vs. POWER OUTPUT

The three charts on this page show the relationship of plate efficiency, power output and grid driving power at plate voltages of 3000, 4000, and 5000 volts. These charts show combined grid and bias losses only. The driving power and power output figures do not include circuit losses. The plate dissipation in watts is indicated by P_p .

Points A, B, and C are identical to the typical Class C operating conditions shown on the first page under 3000, 4000, and 5000 volts respectively.



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