



Twin Tetrode *Type C178*

(VHF AMPLIFIER AND OSCILLATOR)

General. The Type C 178 is a double tetrode primarily intended for use as a Class 'C' amplifier or oscillator at frequencies up to 500 Mc/s. It is fitted with an indirectly heated cathode for series or parallel operation.

→ **Cooling.** Max. temperature of the base pins 180°C.
Max. temperature of bulb and anode seals 200°C.

Natural cooling is sufficient with:

$V_a=750$ V at frequencies up to 100 Mc/s

$V_a=600$ V at frequencies up to 150 Mc/s

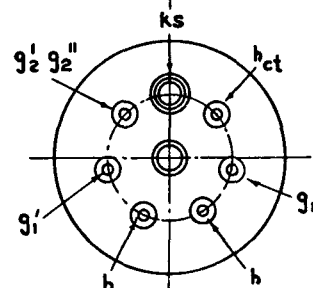
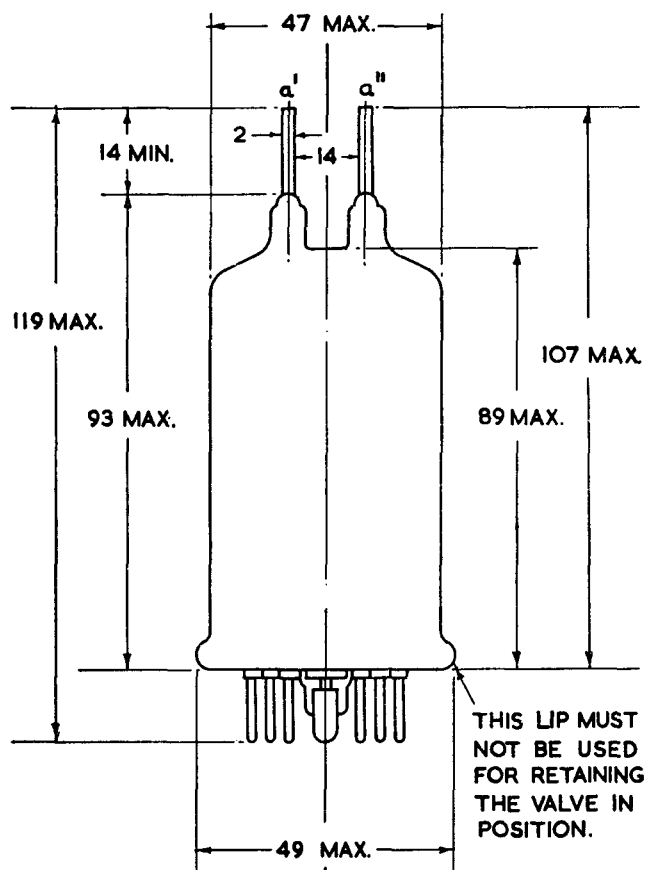
$V_a = 300$ V at frequencies up to 400 Mc/s

When the above limits are exceeded or with high ambient temperatures it may be necessary to direct an airflow of up to 5 cu. ft. per minute onto the top of the bulb to keep the seal temperatures within the stated limit. Anode connectors, providing a high degree of heat transfer by radiation or by conduction should be used.

Mounting. The valve may be mounted vertically, with the base either upwards or downwards; or horizontally, with the anode pins in the horizontal plane.

APPROXIMATE DATA

	Series	Parallel	
V_h	12.6	6.3	V
I_h	0.9	1.8	A
→ g_m	4.5 mA/V	} (each section) at $I_a=30$ mA	
μ_{g1-g2}	8		
→ $V_{a(max)}$		750	V
$P_{a(max)}$		2×20	W
$V_{g2(max)}$		250	V



B7A. BASE.

WEIGHT 2 1/4 oz. (60 gm.)

DIMENSIONS IN MM.

MARCONI'S WIRELESS TELEGRAPH COMPANY LIMITED

Head Office: Marconi House, Chelmsford, England. Telephone: Chelmsford 3221. Telegraphic Address: Expanse, Chelmsford

→ $P_{g2(max)}$	2×3.5	W	R_{g1-k} auto bias	100	k Ω	
$P_{g1(max)}$	2×1	W	V_{h-k}	100	V	←
→ $I_{g1(max)}$	2×5	mA	C_{a-all}	each section	3.2	pF
I_k	2×120	mA	C_{a-g1}			
$I_{k(pk)(max)}$	2×700	mA	C_{g1-all}			
$V_{g1(max)}$	-175	V	C_{out}	two sections	10.5	pF
→ R_{g1-k} fixed bias	50	k Ω	C_{in}	in push-pull	2.1	pF
					6.7	pF

Typical Operation

(1) RF POWER AMPLIFIER CLASS C TELEGRAPHY OR FM TELEPHONY

Maximum ratings

V_a	750	V	I_k	2×120	mA
P_a	2×20	W	$i_{k(pk)}$	2×700	mA
V_{g2}	250	V	V_{g1}	-80	V
P_{g2}	2×3.5	W	R_{g1-k} (fixed bias)	50	k Ω
P_{g1}	2×1.0	W	R_{g1-k} (auto bias)	100	k Ω
I_{g1}	2×5.0	mA	V_{h-k}	100	V

Typical Conditions

f	200	200	400	400	475	475	Mc/s
V_a	400	600	400	540	350	500	V
V_{g2}	250	250	250	250	250	250	V
V_{g1}	-60	-80	-50	-55	-45	-50	V
I_a	2×100	2×100	2×100	2×100	2×100	2×100	mA
I_{g2}	2×8.0	2×9.0	2×5.0	2×7.0	2×4.5	2×4.5	mA
I_{g1}	2×3.0	2×3.5	2×2.0	2×1.5	2×2.0	2×2.0	mA
P_{dr} (a)	3.0	3.0	11	12	10	12	W
P_a	2×12	2×15	2×15	2×20	2×15	2×20	W
P_{out}	56	90	50	68	40	60	W
P_{load} (b)	45	72	39	52	32	45	W

(2) RF POWER AMPLIFIER CLASS C ANODE AND SCREEN GRID MODULATION

Maximum ratings

V_a	600	V
P_a	2×20	W
V_{g2}	250	V
P_{g2}	2×3.0	W
P_{g1}	2×1.0	W
I_k	2×120	mA
$i_{k(pk)}$	2×1.0	A
V_{g1}	-100	V
R_{g1-k} (fixed bias)	50	k Ω
R_{g1-k} (auto bias)	100	k Ω
V_{h-k}	100	V

Typical Conditions

f	200	Mc/s
V_a	500	V
V_{g2}	250	V
V_{g1}	-100	V
I_a	2×90	mA
I_{g2}	2×8.0	mA
I_{g1}	2×1.5	mA
P_{out}	63	W
η	63	%
P_{load} (c) 100% modulation	50	W
P_{mod}	45	W
$V_{g2(pk)mod}$	185	V

(3) FREQUENCY TREBLER CLASS C*Maximum ratings*

V_a	600	V
P_a	2×20	W
V_{g2}	250	V
P_{g2}	2×3.0	W
P_{g1}	2×1.0	W
I_k	2×100	mA
$i_k(pk)$	2×700	mA
V_{g1}	-175	V
R_{g1-k} (fixed bias)	50	k Ω
R_{g1-k} (auto bias)	100	k Ω
V_{h-k}	100	V

Typical Conditions

f_{in}	50	50	70	Mc/s
f_{out}	150	150	210	Mc/s
V_a	400	500	500	V
V_{g2}	250	250	250	V
V_{g1}	-150	-150	-150	V
I_a	2×73	2×60	2×65	mA
I_{g2}	2×8.0	2×5.0	2×10	mA
I_{g1}	2×2.5	2×3.0	2×1.5	mA
$V_{in(pk)}$	2×180	2×180	2×180	V
P_{out}	18	20	12	W
η	31	33	23	%
$P_{load} (c)$	14.5	16	10	W

(4) AF AMPLIFIER OR MODULATOR CLASS B*Maximum ratings*

V_a	600	V
P_a	2×20	W
V_{g2}	250	V
P_{g2}	3.5	W
P_{g1}	2×1.0	W
I_k	2×140	mA
$i_k(pk)$	2×450	mA

R_{g1-k} (fixed bias)	50	k Ω
R_{g1-k} (auto bias)	100	k Ω
V_{h-k}	100	V

Typical Conditions Class B1

V_a	300	450	600	V
V_{g2}	250	250	250	V
V_{g1}	-26	-27	-27	V
I_a (zero-sig)	2×20	2×20	2×20	mA
I_a (max-sig)	2×56	2×58	2×62	mA
I_{g2} (max-sig)	2×14	2×13.5	2×11.5	mA
I_{g1}	0	0	0	mA
$V_{in} (g1-g1) (r.m.s.)$	36	38	39	V
P_a	2×5.6	2×8.5	2×12	W
R_{a-a}	6.5	10	12.5	k Ω
P_{out}	22.5	35	50	W
D_{tot}	2.9	3.1	2.4	%
η	67	67.5	67.5	%

Typical Conditions Class B2

V_a	300	450	600	V
V_{g2}	250	250	250	V
V_{g1}	-25	-25	-25	V
I_a (zero-sig)	2×25	2×25	2×25	mA
I_a (max-sig)	2×94	2×97	2×100	mA
I_{g2} (max-sig)	2×14	2×14	2×13	mA
I_{g1}	2×2.6	2×2.6	2×2.6	mA
$V_{in} (g1-g1) (r.m.s.)$	52	54	55	V
P_a	2×9.7	2×13.5	2×17	W
R_{a-a}	4.0	6.0	8.0	k Ω
P_{out}	37	60	86	W
D_{tot}	5.0	5.0	5.0	%
η	65.5	69	71.5	%

NOTES

- (a) Drive power includes typical fixed frequency grid-circuit loss.
 (b) Typical load powers.
 (c) With a circuit transfer efficiency of 80%.

