

Directly heated v.h.f. power pentode for use as a power amplifier or frequency multiplier in portable and mobile equipment.

FILAMENT (parallel operation only)

V_f	1.1 ($\pm 15\%$)	V
I_f	880	mA
t_n max. ($P_{out} = 70\%$ of final value)	0.5	s

CAPACITANCES (unshielded)

C_{a-g1}	< 150	mpF
C_{in}	6.0	pF ←
C_{out}	3.5	pF ←
C_{g1-f}	1.5	pF

CHARACTERISTICS

V_a	120	V
V_{g2}	120	V
V_{g1}	-6.5	V
I_a	30	mA
I_{g2}	2.3	mA
g_m	4.3	mA/V
μ_{g1-g2}	7.0	

RATINGS (DESIGN CENTRE SYSTEM)

$V_{a(b)}$ max.	500	V
V_a max.	300	V
P_a max.	5.0	W
$V_{g2(b)}$ max.	500	V
V_{g2} max.	300	V
P_{g2} max.	1.0	W
V_{g1} max.	-100	V
+ $V_{g1(pk)}$ max.	25	V
I_k max.	50	mA
R_{g1-f} max.	2.0	MΩ
T_{bulb} max.	200	°C
V_f max. (absolute)	1.27	V
V_f min. (absolute)	0.93	V

CLASS 'C' OPERATION F.M. TELEPHONY

Maximum recommended operating conditions

These conditions are based on reaching either the maximum electrode ratings or the point where load efficiency (η_{load}) begins to fall rapidly. The conditions for 175Mc/s were measured in a circuit with a parallel tuned output circuit. If a series tuned output circuit is used at this frequency with the same operating conditions, approx. 10% higher P_{load} figures are obtained.

CLASS 'C' OPERATION F.M. TELEPHONY AT $f = 50\text{Mc/s}$

	V_a (V)	V_{g2} (V)	V_{g1} (V)	I_a max. (mA)
Power amplifier	300	150	-35	40
	250	150	-35	40
	200	150	-35	40
	150	150	-35	32
	100	100	-23	22
Frequency doubler	V_a (V)	V_{g2} (V)	V_{g1} (V)	I_a max. (mA)
	300	150	-90	40
	250	150	-90	40
	200	150	-90	38
	150	150	-90	32
100	100	-60	20	
Frequency trebler	V_a (V)	V_{g2} (V)	V_{g1} (V)	I_a max. (mA)
	300	150	-100	29
	250	150	-100	35
	200	150	-100	32
	150	150	-100	28
100	100	-100	20	

CLASS 'C' OPERATION F.M. TELEPHONY AT $f = 175\text{Mc/s}$

	V_a (V)	V_{g2} (V)	V_{g1} (V)	I_a max. (mA)
Power amplifier	300	150	-35	30
	250	150	-35	37
	200	150	-35	40
	150	150	-35	40
	100	100	-23	28
Frequency doubler	V_a (V)	V_{g2} (V)	V_{g1} (V)	I_a max. (mA)
	300	150	-90	26
	250	150	-90	32
	200	150	-90	38
	150	150	-90	32
100	100	-90	20	
Frequency trebler	V_a (V)	V_{g2} (V)	V_{g1} (V)	I_a max. (mA)
	250	150	-100	27
	200	150	-100	32
	150	150	-100	28
	100	100	-100	20

TYPICAL OPERATION CLASS 'C' OPERATION F.M. TELEPHONY

Amplifier at $f = 50\text{Mc/s}$

V_a (V)	V_{g2} (V)	V_{g1} (V)	I_a (mA)	I_{g2} (mA)	I_{g1} (mA)	$+V_{g1(pk)}$ (V)	P_{load} (W)	η_{load} (%)
300	150	-35	10	1.45	0.006	-4.5	1.68	56
			20	2.6	0.045	2.5	3.8	63.3
			30	3.0	0.45	9.0	6.1	67.8
			40	3.5	0.85	14.5	8.0	66.6
250	150	-35	10	1.62	0.008	-2.0	1.5	60
			20	3.1	0.08	3.5	3.3	65
			30	4.0	0.55	10	5.1	68
			40	5.0	0.95	17	6.7	67
200	150	-35	10	1.95	0.025	-1.5	1.3	65
			20	3.8	0.20	5.5	2.75	69
			30	5.0	0.75	12	4.1	68
			40	6.0	1.05	18	5.2	65
150	150	-35	10	2.6	0.038	-1.0	1.0	67
			20	4.3	0.24	6.0	2.05	68
			30	6.0	0.85	13.5	2.95	65.5
100	100	-23	10	2.1	0.09	1.5	0.6	60
			20	3.4	0.7	9.0	1.22	61
			25	4.5	1.2	13	1.45	57.6

Frequency doubler at $f_{out} = 50\text{Mc/s}$

V_a (V)	V_{g2} (V)	V_{g1} (V)	I_a (mA)	I_{g2} (mA)	I_{g1} (mA)	$+V_{g1(pk)}$ (V)	P_{load} (W)	η_{load} (%)
300	150	-90	10	1.38	0.015	0.5	1.58	52.7
			20	2.15	0.28	8.5	3.42	57
			30	2.6	0.73	15	5.15	57.2
			40	3.4	0.95	21	6.62	55.1
250	150	-90	10	1.6	0.024	1.2	1.36	54.4
			20	2.4	0.38	9.5	3.0	60
			30	3.2	0.80	15.5	4.45	59.3
			40	4.2	1.02	22	5.6	56
200	150	-90	10	2.05	0.04	2.0	1.16	58
			20	2.9	0.45	10	2.5	62.5
			30	3.6	0.85	16.5	3.5	58.3
150	150	-90	10	2.4	0.05	2.5	0.86	57.3
			20	3.8	0.56	11	1.8	60
			30	4.5	0.95	18	2.48	55.2
100	100	-60	10	1.95	0.26	6.0	0.53	53
			20	3.1	0.92	13	0.94	47



Frequency trebler at $f_{out} = 50\text{Mc/s}$

V_a (V)	V_{g2} (V)	V_{g1} (V)	I_a (mA)	I_{g2} (mA)	I_{g1} (mA)	$+V_{g1(pk)}$ (V)	P_{load} (W)	η_{load} (%)
300	150	-100	10	1.0	0.01	0.8	1.2	40
			20	1.75	0.26	9.5	2.6	43.3
250	150	-100	10	1.16	0.012	1.0	1.05	42
			20	1.9	0.3	10	2.24	44.8
			30	2.3	0.7	17	3.2	42.7
200	150	-100	10	1.4	0.015	1.3	0.9	45
			20	2.05	0.35	10.5	1.88	47
			30	2.45	0.72	17.5	2.7	45
150	150	-100	10	1.7	0.027	1.9	0.67	44.7
			20	2.35	0.39	11	1.44	48
100	100	-100	10	1.1	0.29	7.5	0.47	47
			20	2.2	1.02	17	0.8	40

Amplifier at $f = 175\text{Mc/s}$

V_a (V)	V_{g2} (V)	V_{g1} (V)	I_a (mA)	I_{g2} (mA)	I_{g1} (mA)	P_{load} (W)	η_{load} (%)
300	150	-35	15	0.9	0	0.98	21.7
			20	1.34	0	1.66	27.7
			25	1.56	0.01	2.48	33.1
			30	2.08	0.07	3.3	36.7
250	150	-35	15	1.0	0	0.91	24.3
			20	1.42	0	1.48	29.4
			25	1.96	0.01	2.17	34.7
			30	2.25	0.1	2.88	38.5
			35	2.42	0.2	3.6	41.1
200	150	-35	15	1.3	0	0.81	27
			20	1.96	0	1.37	32.5
			25	2.12	0.02	1.9	38
			30	2.4	0.11	2.5	41.7
			35	2.64	0.28	3.08	44
			40	3.0	0.5	3.69	46.1
150	150	-35	15	1.74	0	0.7	31.1
			20	2.14	0.01	1.14	38
			25	2.5	0.03	1.56	41.7
			30	2.9	0.12	2.0	44.5
			35	3.2	0.3	2.42	46.1
			40	3.5	0.55	2.82	47
100	100	-23	15	1.28	0.04	0.56	37.3
			20	1.5	0.22	0.89	44.5
			25	1.82	0.54	1.18	47.2



Frequency doubler at $f_{out} = 175\text{Mc/s}$

V_a (V)	V_{g2} (V)	V_{g1} (V)	I_a (mA)	I_{g2} (mA)	I_{g1} (mA)	P_{load} (W)	η_{load} (%)
300	150	-90	15	0.84	0	0.82	18.2
			20	1.1	0.12	1.46	24.3
			25	1.22	0.34	2.1	28
250	150	-90	15	0.98	0.02	0.8	21.3
			20	1.26	0.15	1.35	27
			25	1.4	0.4	1.88	30
			30	1.62	0.6	2.4	32
200	150	-90	15	1.2	0.04	0.73	24.3
			20	1.4	0.22	1.2	30
			25	1.6	0.42	1.7	34
			30	1.85	0.66	2.15	35.9
			35	2.0	0.8	2.55	36.5
150	150	-90	15	1.58	0.06	0.66	29.4
			20	1.76	0.26	1.04	34.7
			25	2.07	0.46	1.42	37.9
			30	2.25	0.72	1.78	39.5
			35	2.36	0.88	2.1	40
100	100	-60	15	1.0	0.38	0.54	36
			20	1.36	0.7	0.74	37

Frequency trebler $f_{out} = 175\text{Mc/s}$

V_a (V)	V_{g2} (V)	V_{g1} (V)	I_a (mA)	I_{g2} (mA)	I_{g1} (mA)	P_{load} (W)	η_{load} (%)
250	150	-100	15	0.88	0.04	0.6	16
			20	1.12	0.18	0.95	19
			25	1.26	0.4	1.29	20.7
200	150	-100	15	1.02	0.05	0.55	18.3
			20	1.24	0.22	0.86	21.5
			25	1.42	0.42	1.15	23
			30	1.66	0.6	1.42	23.7
150	150	-100	15	1.26	0.07	0.49	21.8
			20	1.42	0.30	0.76	25.3
			25	1.64	0.44	0.99	26.4
100	100	-100	15	0.94	0.52	0.4	26.7
			20	1.5	0.84	0.5	25

CLASS 'C' A.M. TELEPHONY

Maximum carrier conditions for 100% modulation

Output tuned circuit

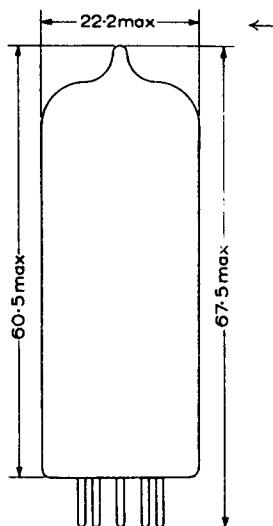
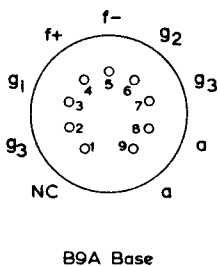
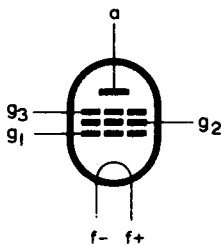
	Single valve operation			Push-pull operation		
	Parallel	Parallel	Series			
f	50	175	175	50	175	Mc/s
V _a	250	200	200	250	200	V
V _{g2}	150	150	150	150	150	V
V _{g1}	-35	-35	-35	-35	-35	V
I _a	32	31	32	2 × 32	2 × 32	mA
I _{g2}	4.2	2.45	2.5	2 × 4.2	2 × 2.5	mA
I _{g1}	0.62	0.14	0.18	2 × 0.62	2 × 0.18	mA
P _{load}	5.4	2.65	3.05	12	6.2	W
η	67.5	42	47	75	48.5	%
For 100% modulation						
P _{mod}	4.2	3.2	3.3	8.4	6.4	W
V _{g2(pk)}	135	120	120	135	120	V

Maximum carrier conditions for anode and screen-grid modulation for various modulation depths. f = 175Mc/s

m (%)	V _a (V)	I _a (mA)	P _a (max.) (W)	P _{g2} (max.) (W)	P _{load} * (W)	Output tuned circuit
100	200	31	3.3	0.67	2.65	Parallel
	200	32	3.3	0.67	3.05	Series
	200	64	2 × 3.3	2 × 0.67	6.2	Push-Pull
75	220	34	3.9	0.78	3.2	Parallel
	220	35	3.9	0.78	3.65	Series
	220	70	2 × 3.9	2 × 0.78	7.4	Push-Pull
50	235	35	4.45	0.89	3.47	Parallel
	235	36	4.45	0.89	3.96	Series
	235	72	2 × 4.45	2 × 0.89	8.0	Push-Pull
25	245	37	4.85	0.97	3.82	Parallel
	245	38	4.85	0.97	4.37	Series
	245	76	2 × 4.85	0.97	8.8	Push-Pull
0	250	38	5.0	1.0	4.02	Parallel
	250	39	5.0	1.0	4.55	Series
	250	80	2 × 5.0	2 × 1.0	9.6	Push-Pull

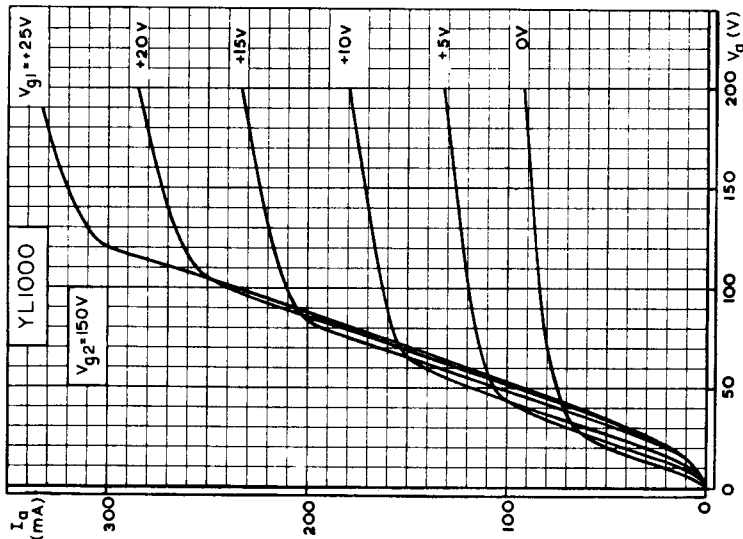
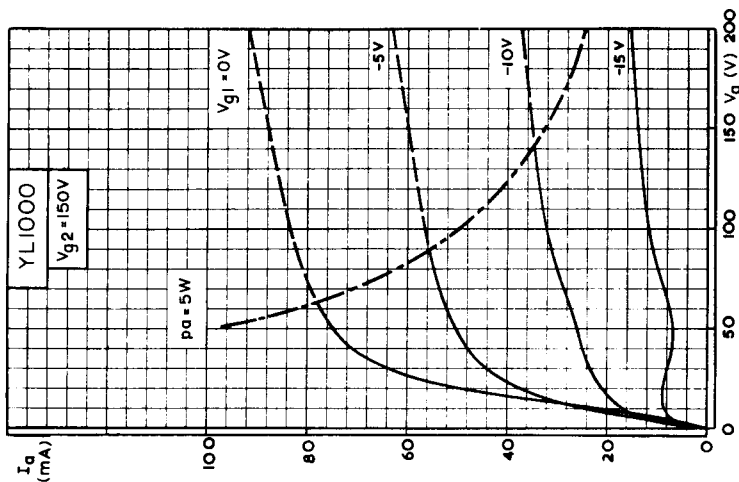
*Estimated value

These conditions may be varied for operation at lower frequencies. Operation at 100% modulation with V_a > 250V, I_a > 32mA is not permitted and the P_a max. and P_{g2} max. limits shown above must never be exceeded.

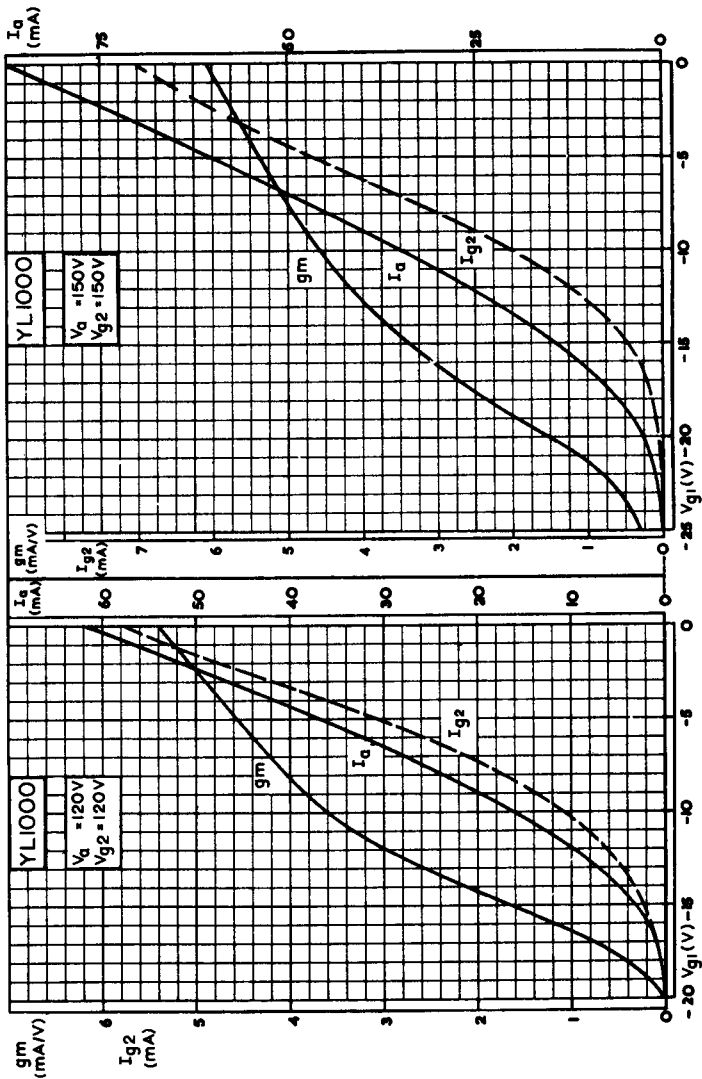


All dimensions in mm

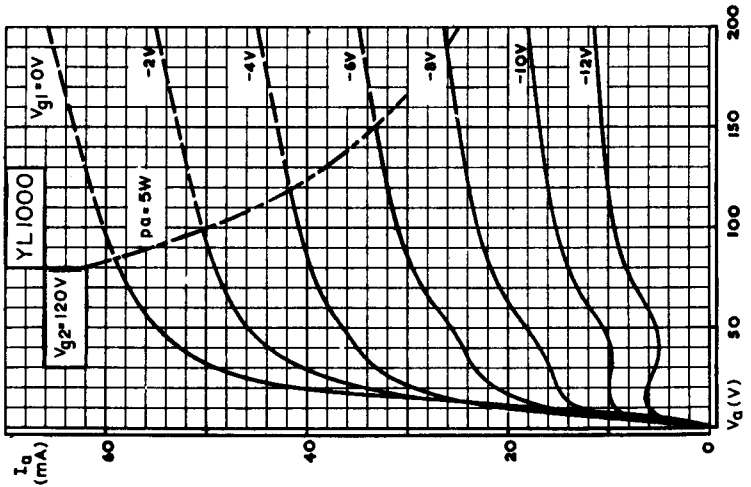
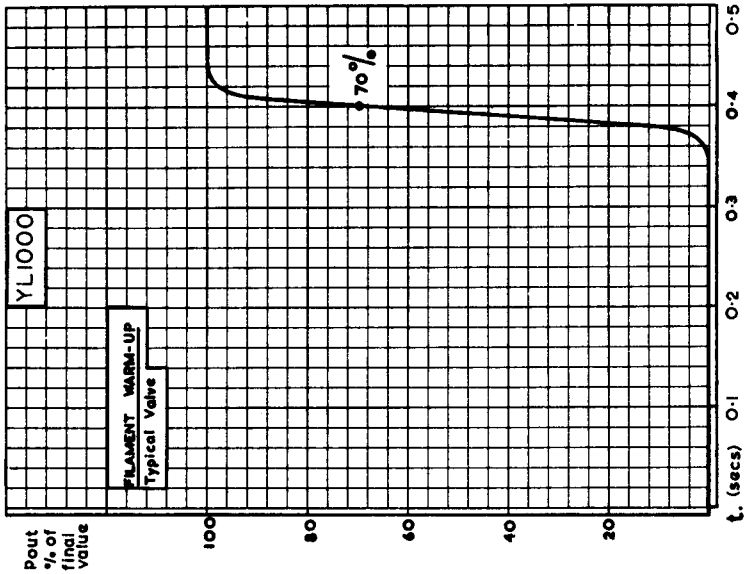
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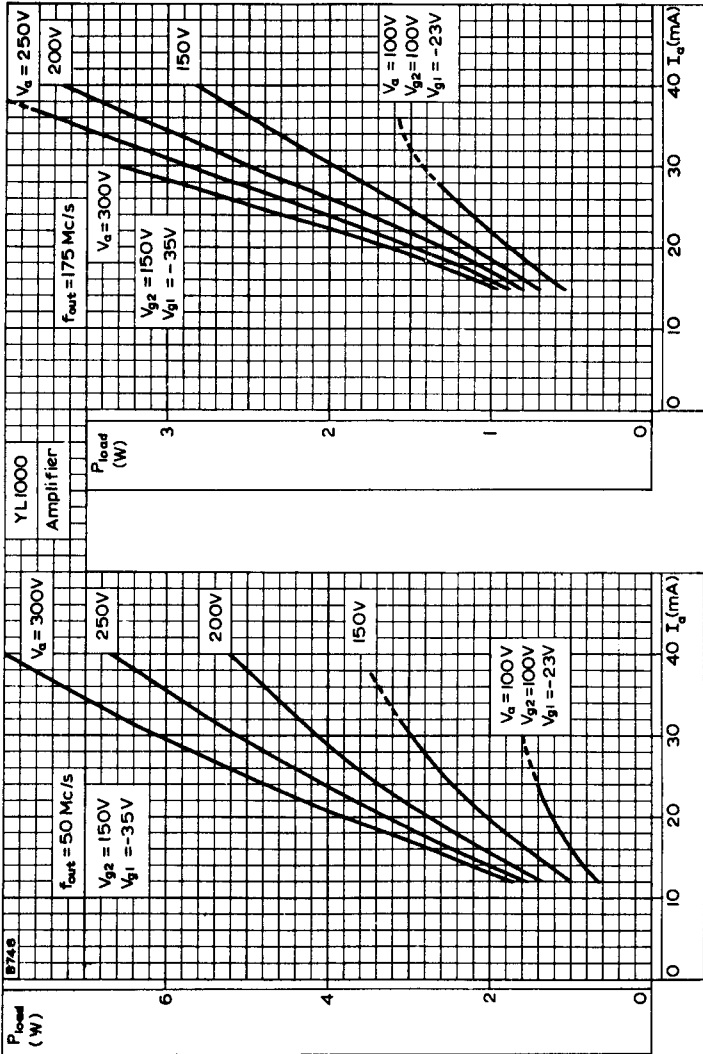
ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER $V_{g2} = 150V$



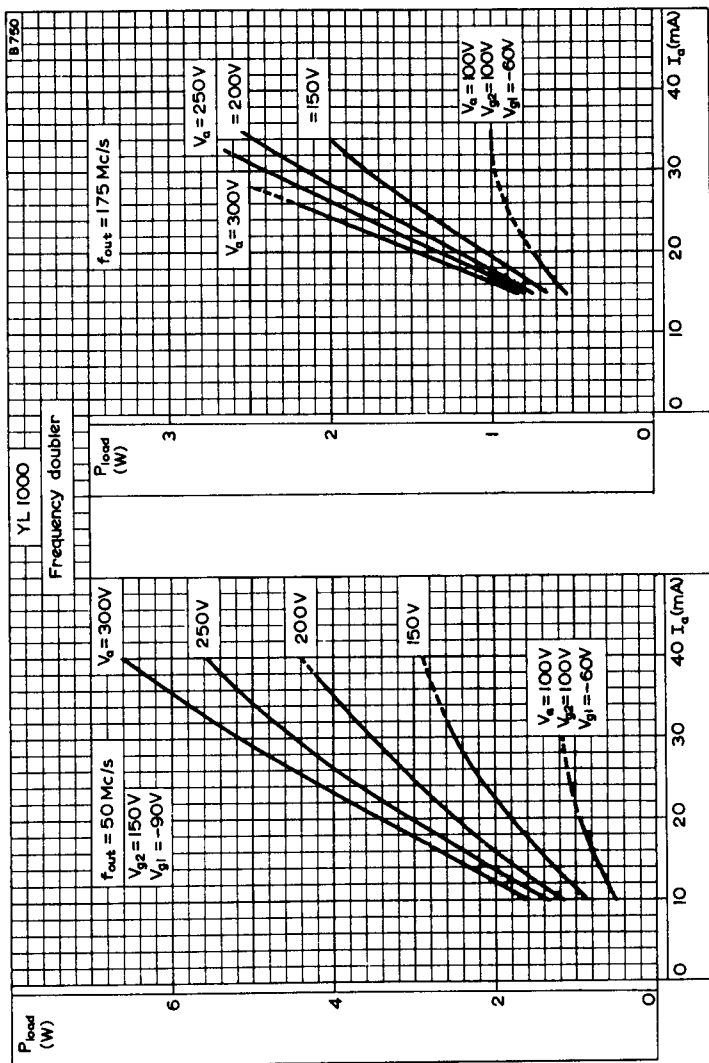
ANODE CURRENT, SCREEN-GRID CURRENT, AND MUTUAL CONDUCTANCE PLOTTED AGAINST CONTROL-GRID VOLTAGE



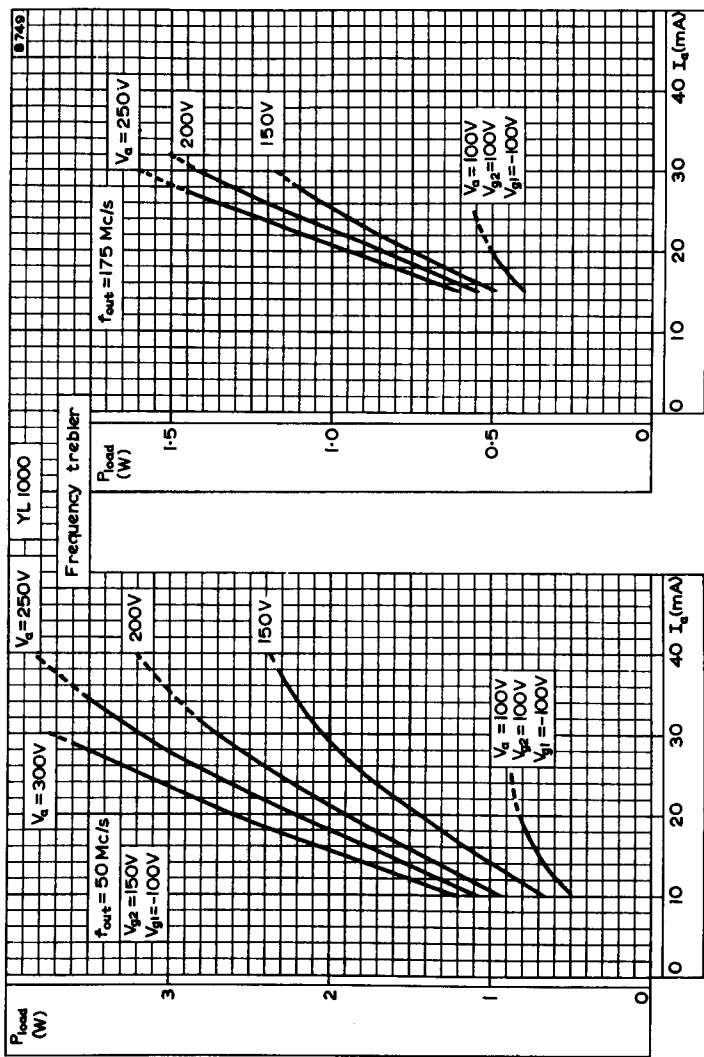
ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER $V_{g2}=120V$
FILAMENT WARM-UP TIME



LOAD POWER AS AN AMPLIFIER PLOTTED AGAINST ANODE CURRENT FOR VARIOUS ANODE VOLTAGES



LOAD POWER AS A FREQUENCY DOUBLER PLOTTED AGAINST ANODE CURRENT FOR VARIOUS ANODE VOLTAGES



LOAD POWER AS A FREQUENCY TREBLER PLOTTED AGAINST ANODE CURRENT FOR VARIOUS ANODE VOLTAGES