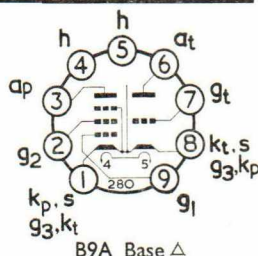


V.H.F. FREQUENCY CHANGER



GENERAL

This triode and variable mu pentode valve combination of frame grid construction is for use in television tuners. It is primarily intended to be used as a variable gain V.H.F. frequency changer with the triode as local oscillator but the pentode is also designed for use as a high gain controlled I.F. amplifier following a U.H.F. tuner.

Heater Current	I_h	0.3	A
Heater Voltage	V_h	7.4	V

RATINGS

	Pentode	Triode	
Maximum Anode Dissipation	$P_a(\text{max})$	2.0	W
Maximum Screen Grid Dissipation	$P_{g2}(\text{max})$	0.5	W
Maximum Anode Voltage	$V_a(\text{max})$	250	V
Maximum Screen Grid Voltage	$V_{g2}(\text{max})$	230	V
Maximum Heater to Cathode Voltage (R.M.S.)	$V_{h-k(r.m.s.)\text{max}}$	200	V
Maximum Cathode Current	$I_k(\text{max})$	18	mA
Maximum Grid to Cathode Resistance (Fixed Bias)	$R_{g1}(\text{max})$	250	500 $k\Omega$

INTER-ELECTRODE CAPACITANCES

	*	†	‡	
Grid 1 to all	$C_{g1-\text{all}}$	6.5	7.2	8.1 pF
Anode Pentode to all	$C_{ap-\text{all}}$	2.8	3.0	4.0 pF
Grid 1 to Anode Pentode	C_{g1-ap}	0.008	0.01	0.012 pF
Anode Triode to Earth	C_{at-E}	2.1	2.2	3.0 pF
Grid Triode to Earth	C_{gt-E}	3.3	3.4	4.2 pF
Anode Pentode to Grid Triode	C_{ap-gt}	0.0015	0.0025	0.004 pF
Grid Triode to Anode Triode	C_{gt-at}	1.9	2.0	2.2 pF
Anode Pentode to Anode Triode	C_{ap-at}	0.009	0.012	0.015 pF
Grid 1 to Grid Triode	C_{g1-gt}	0.008	0.016	0.035 pF
Grid 1 to Anode Triode	C_{g1-at}	0.003	0.0065	0.011 pF

* In fully-shielded socket with can (I.E.C. Publication 100).

† With holder capacity balanced out but with cylindrical screen can (Holder as below).

‡ Total capacity including ceramic B9A holder with cylindrical screen (Plessey holder type CP180024/3).

CHARACTERISTICS

	Pentode	Triode	
Anode Voltage	V_a	125	100 V
Screen Grid Voltage	V_{g2}	125	— V
Control Grid Voltage	V_{g1}	-1.5	-3.2 V
Anode Current	I_a	10	15 mA
Screen Grid Current	I_{g2}	3	— mA
Mutual Conductance	g_m	11	8.5 mA/V
Amplification Factor	μ	—	20
Inner Amplification Factor	μ_{g1-g2}	45	—

Δ Shield completely surrounds pentode. The basing is arranged to minimise pentode cathode lead inductance effects with the shorter lead to pin 1.

The basing is identical to that of the 30C15/PCF800.

TYPICAL OPERATION AS FREQUENCY CHANGER AND
I.F. AMPLIFIER

Grid current bias operation with A.G.C. Oscillator voltage injected into grid 1.

Pentode

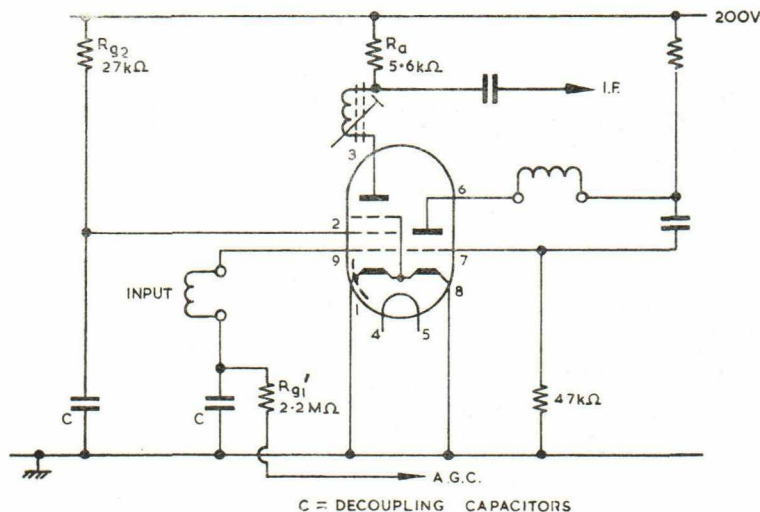
	f	F.C.	I.F.*	
Frequency	200	200	36	Mc/s
Supply Voltage	V_b	200	200	V
Anode Voltage (Decoupling	V_a	160	130	V
Resistance, $R_a=5.6k\Omega$ (approx.)	V_{g2}	150	100	V
Screen Grid Voltage ($R_{g2}=27k\Omega$) (approx.)	$R_{g1'}$	2.2	2.2	M Ω
Grid 1 Resistance	I_{g1}	1.3	0.3	μA
Current through Grid 1 resistance	I_a	7.3	12.5	mA
Anode Current (approx.)	I_{g2}	1.8	3.7	mA
Screen Grid Current (approx.)				
Conversion Conductance at	g_c	4.8	—	mA/V
1 Mc/s (V_b, R_a, R_{g1}, R_{g2} as above)	$V_{g1(gc/10)}$	-6.5	—	V
Grid Voltage for Conversion Conductance	g_m	—	15	mA/V
reduction 10 : 1	$V_{g1(gm/10)}$	—	-4.8	V
Mutual Conductance (V_b, R_a, R_{g1}, R_{g2} as above)	$V_{g1(gm/100)}$	—	-6.6	V
Grid Voltage for Mutual Conductance	r_{g1}	—	11	k Ω
reduction 10 : 1	$C_{in(w)}$	—	11†	pF
Grid Voltage for Mutual Conductance	$\Delta C_{in(w)}$	—	2.7	pF
reduction 100 : 1				
Valve Input Resistance (Anode short circuited)				
Working Input Capacitance				
Change in Input Capacitance by biasing valve to cut off				

Triode

Anode Voltage	V_a	60	V
Anode Current	I_a	7	mA
Rectified Grid Voltage (Grid Resistance = 47k Ω)	V_g	6	V

* Supply voltage removed from triode.

† With holder capacitance balanced out but with can.



TYPICAL OPERATION AS FREQUENCY CHANGER AND I.F. AMPLIFIER

Partial grid current bias can be used for the frequency changer operation when a rectified voltage of greater than 8V d.c. is available from the triode grid resistor. This reduces the delay in the initial $V_{a.g.c.}/g_c$ characteristic as shown on page 10. The heterodyne voltage is injected into grid 1.

Pentode

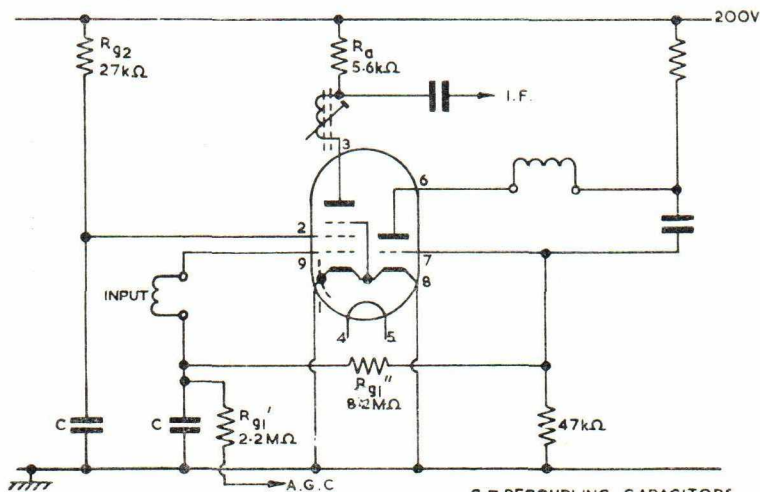
	f	F.C.	I.F.*	
Frequency	200	36		Mc/s
Supply Voltage	V_b	200	200	V
Anode Voltage (Decoupling)				
Resistance, $R_a=5.6k\Omega$ (approx.)	V_a	160	130	V
Screen Grid Voltage ($R_{g2}=27k\Omega$) (approx.)	V_{g2}	150	100	V
Current through resistance $R_{g1'}$ ($R_{g1'}=2.2M\Omega$)		1.8	0.3	μA
Resistance to provide bias from Triode Grid	$R_{g1''}$	8.2	8.2	$M\Omega$
Anode Current (approx.)	I_a	7.3	12.5	mA
Screen Grid Current (approx.)	I_{g2}	1.8	3.7	mA
Conversion Conductance at				
1 Mc/s (V_b, R_a, R_{g1}, R_{g2} as above)	g_c	4.7	—	mA/V
Grid Voltage for Conversion Conductance				
reduction 10 : 1	$V_{g1}(g_c/10)$	-5.4	—	V
Mutual Conductance (V_b, R_a, R_{g1}, R_{g2} as above)	g_m	—	15	mA/V
Grid Voltage for Mutual Conductance				
reduction 10 : 1	$V_{g1}(g_m/10h)$	—	-6	V
Grid Voltage for Mutual Conductance				
reduction 100 : 1	$V_{g1}(g_m/100)$	—	-8.3	V
Valve Input Resistance (Anode short circuited)	r_{g1}	—	11	$k\Omega$
Working Input Capacitance	$C_{in(w)}$	—	11†	pF
Change in Input Capacitance by biasing valve to cut off	$\Delta C_{in(w)}$	—	2.7	pF

Triode

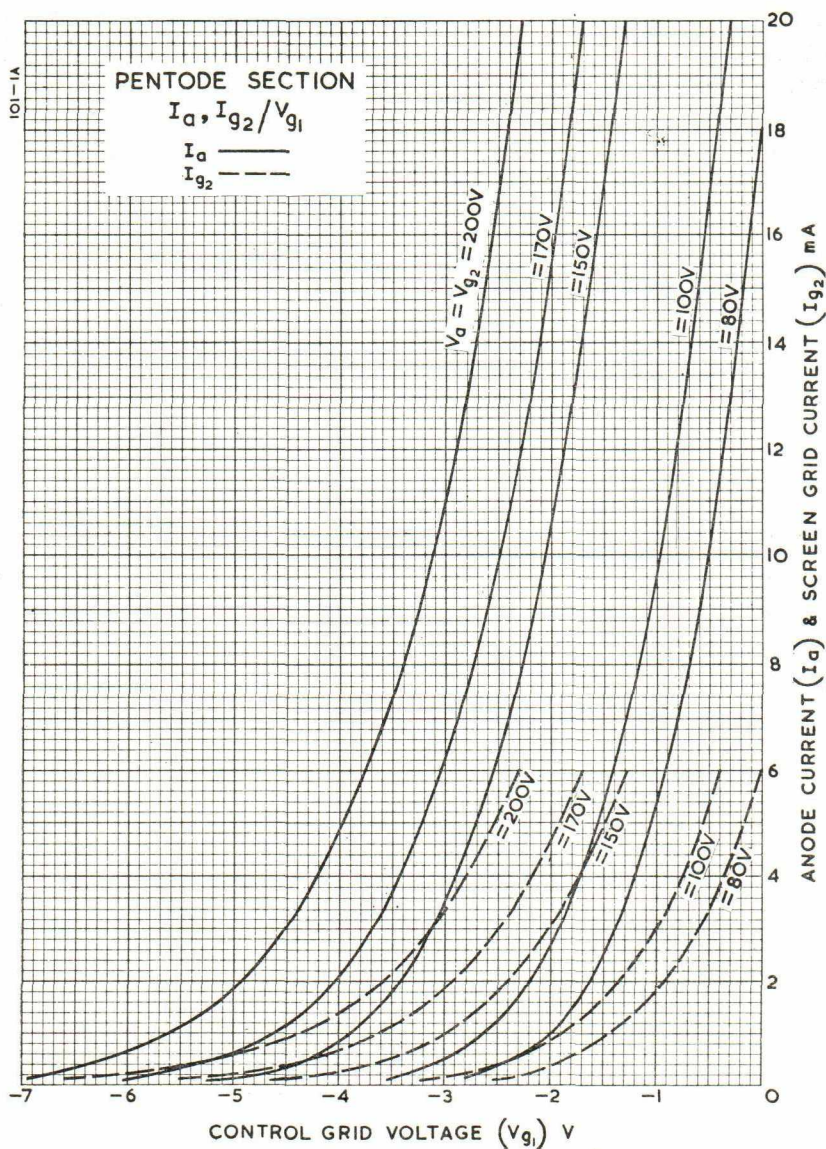
Anode Voltage	V_a	70	V
Anode Current	I_a	9	mA
Rectified Grid Voltage (Grid Resistance = $47k\Omega$)	V_g	11	V

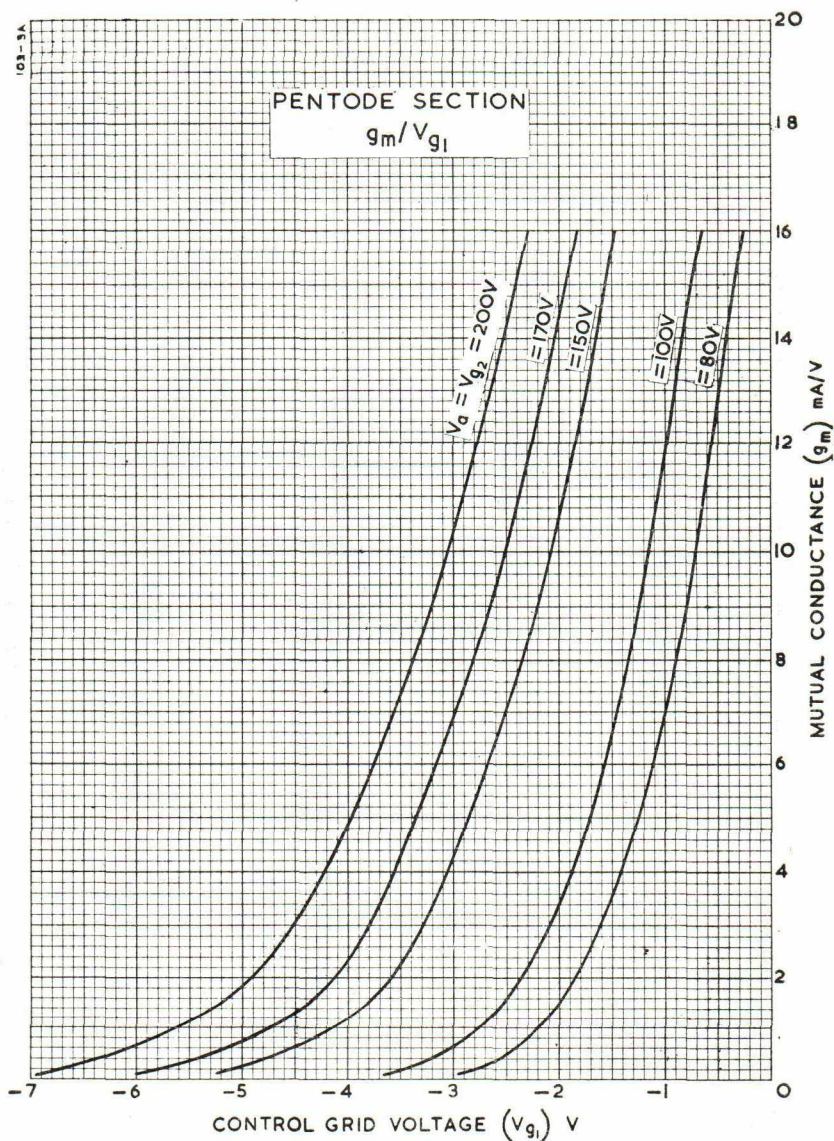
* Supply voltage removed from triode.

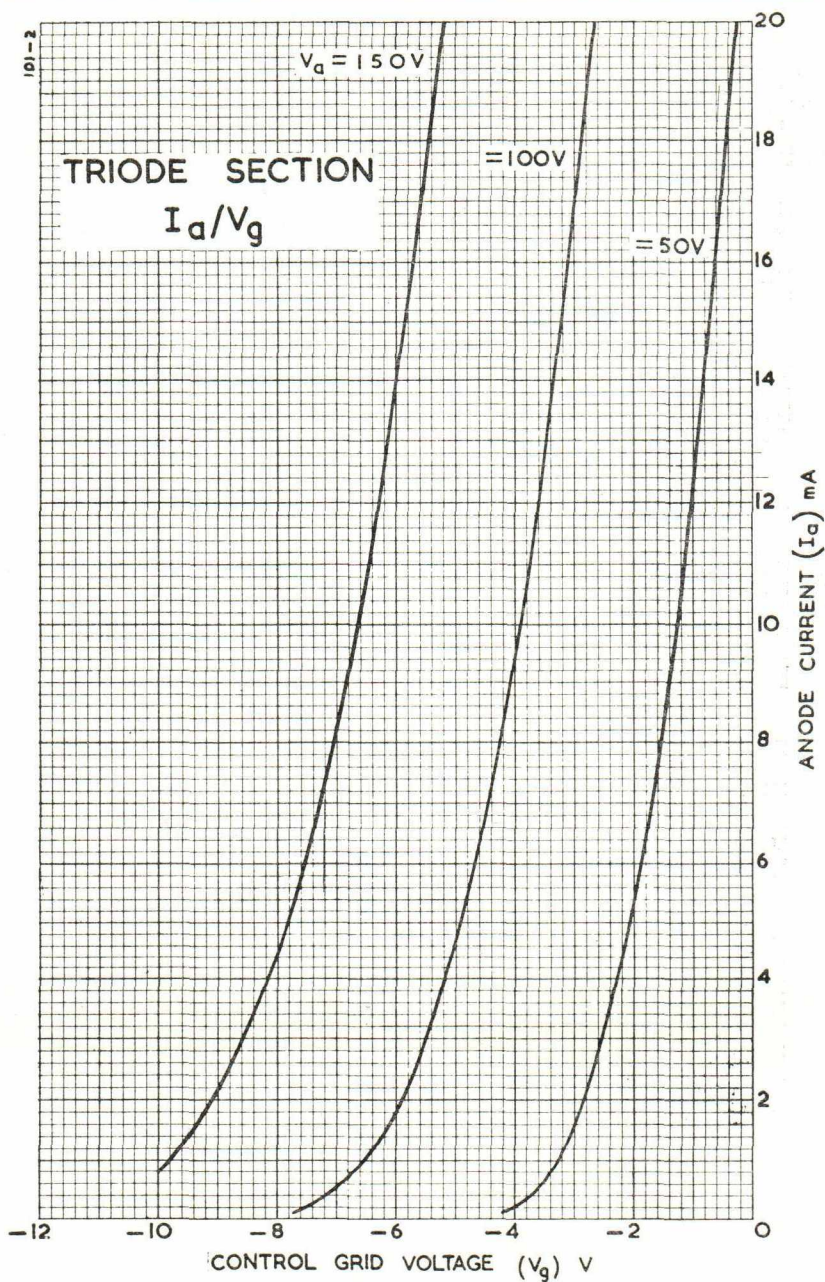
† With holder capacitance balanced out but with can.

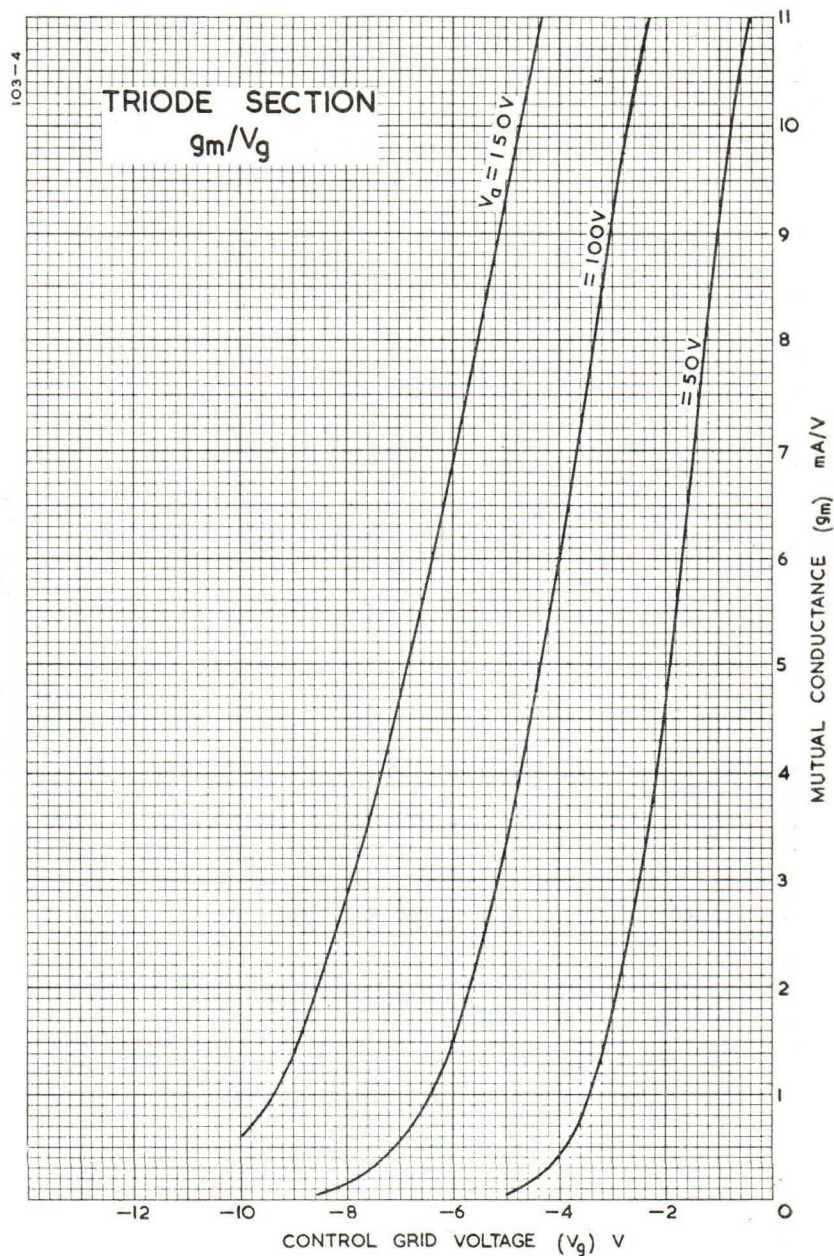


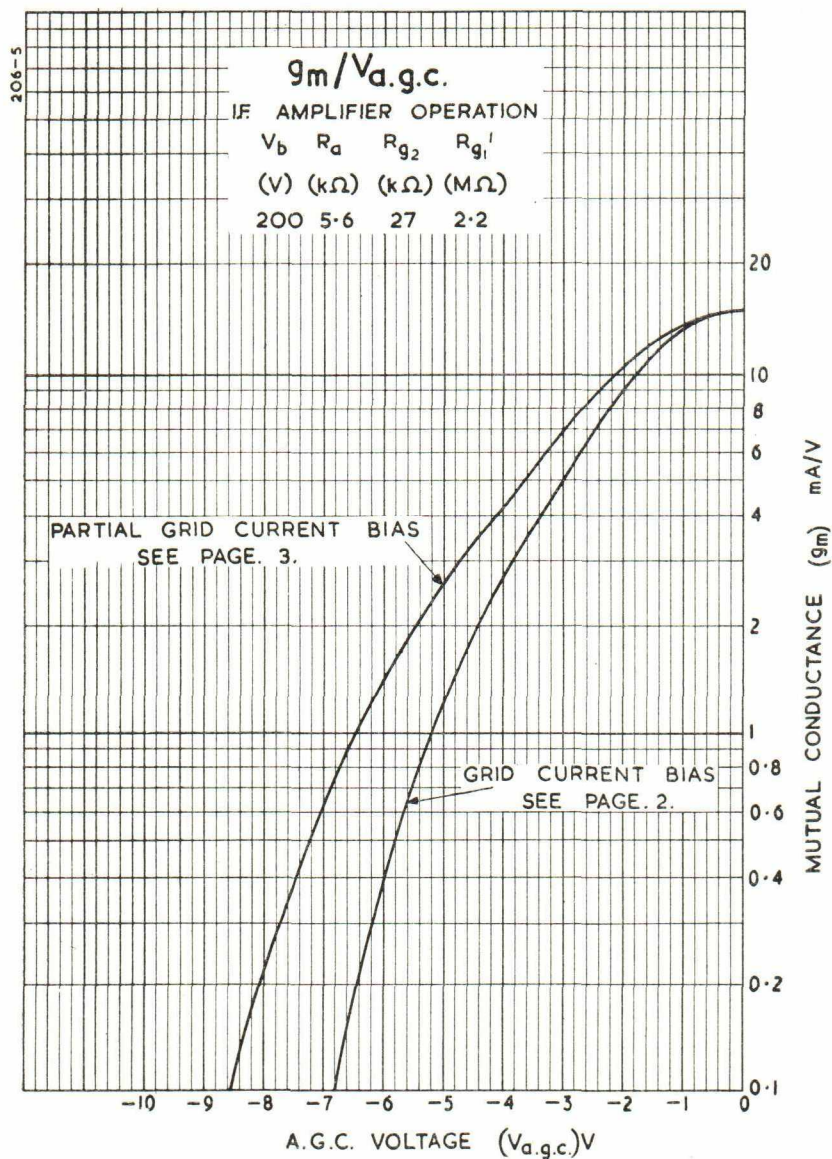
MOUNTING POSITION—Unrestricted

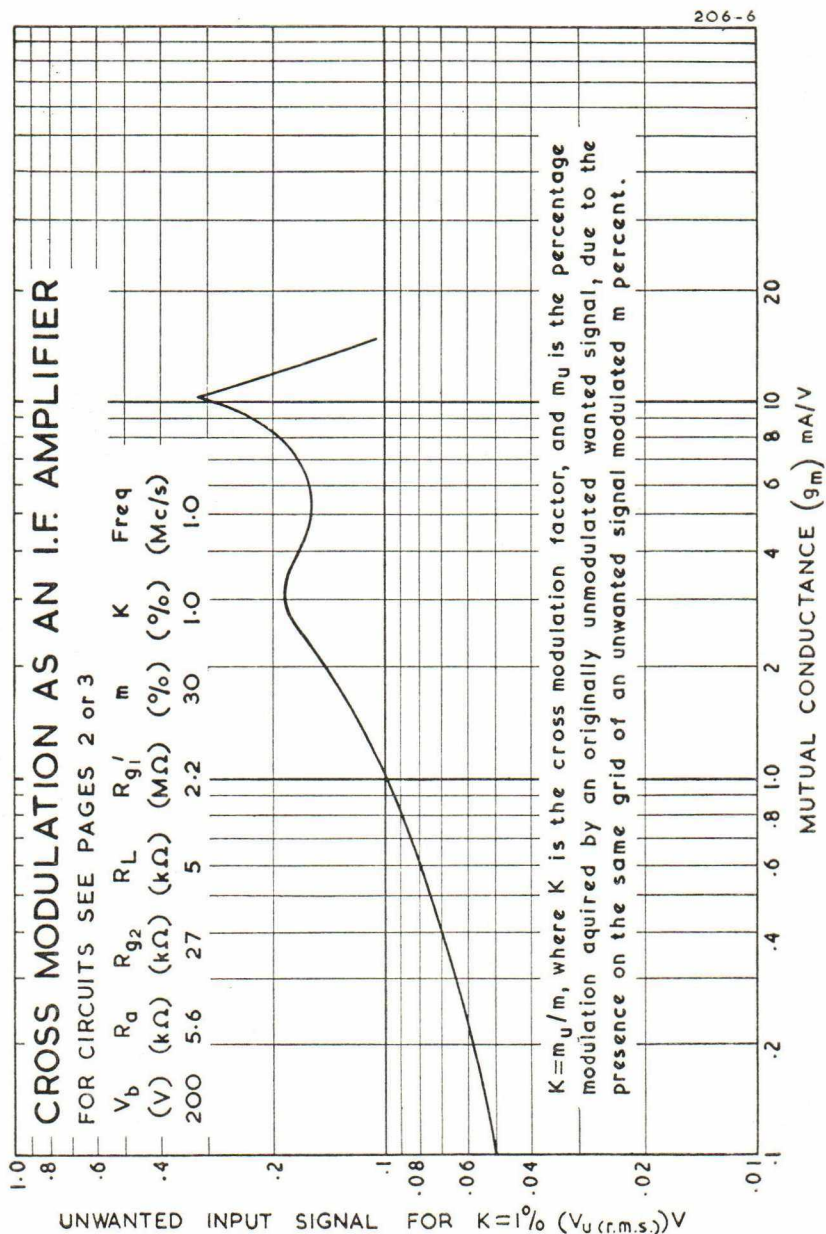


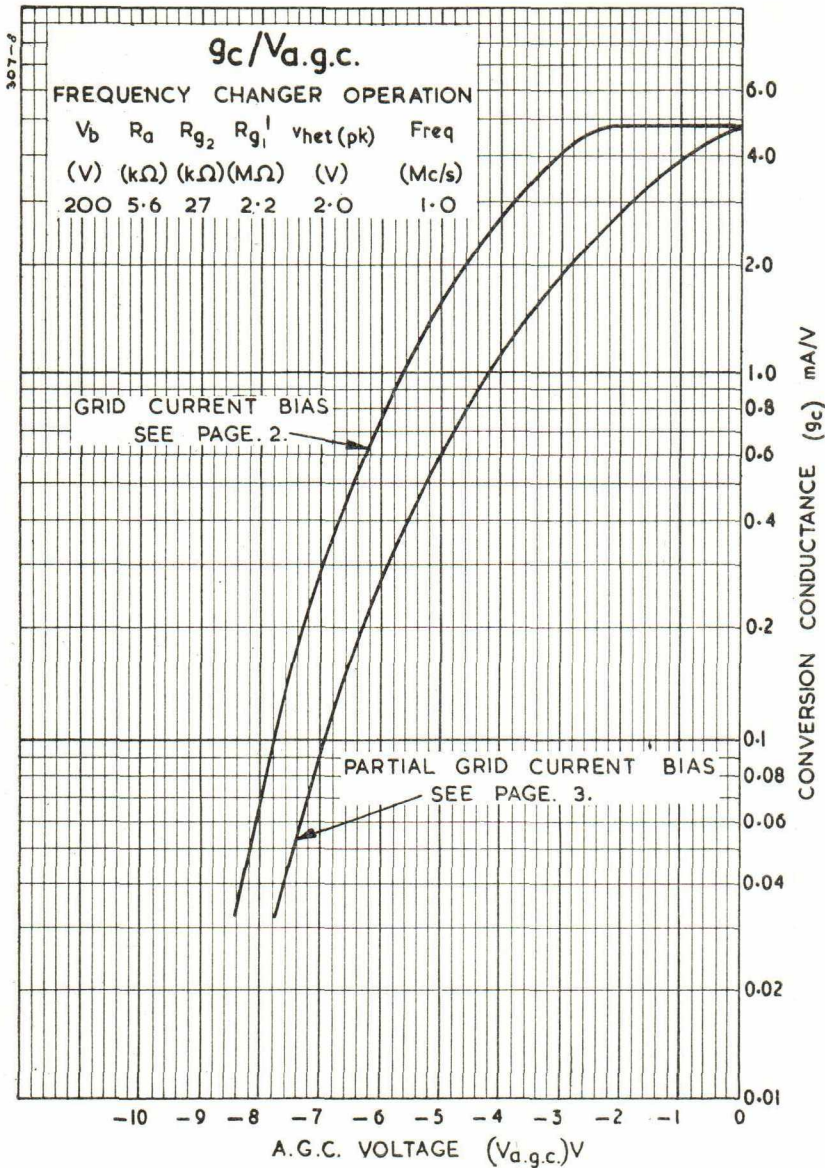


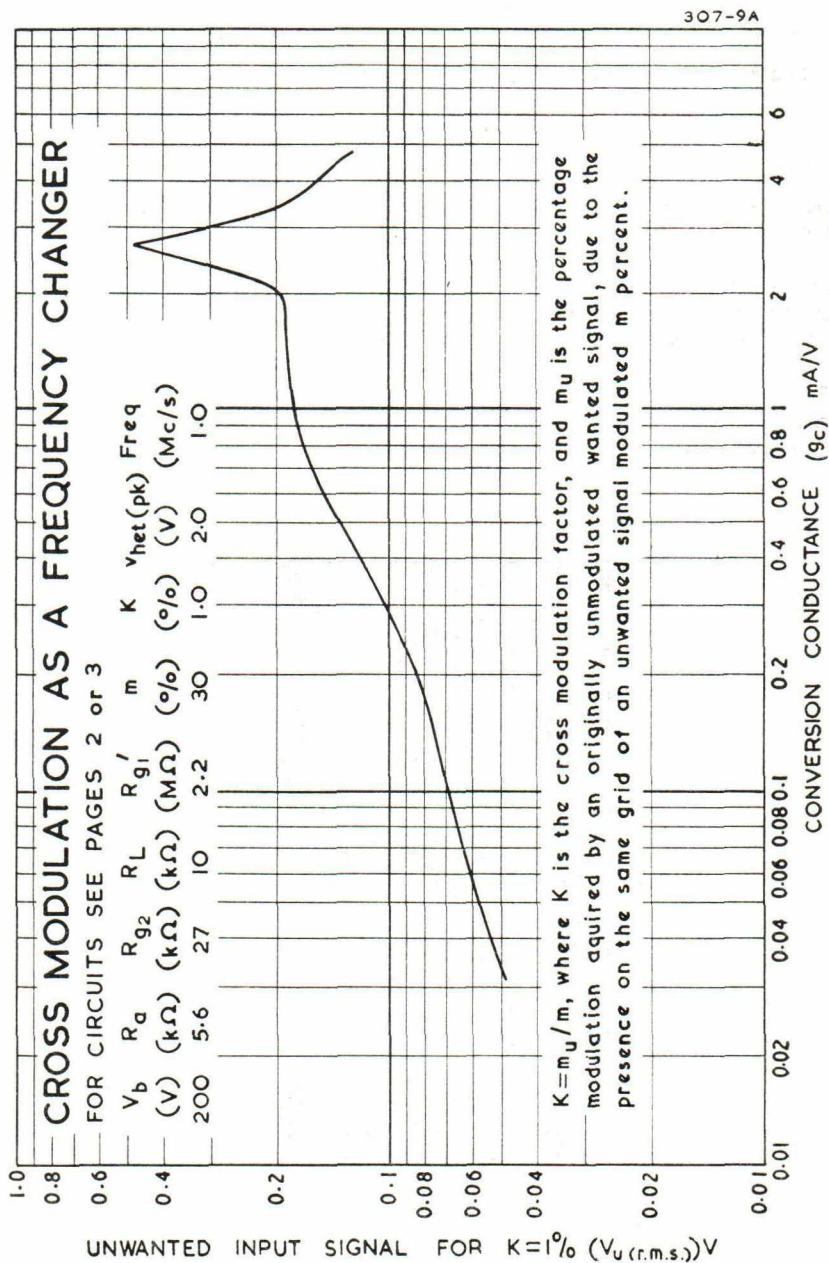












TYPICAL OPERATION AS FREQUENCY CHANGER AT 200Mc/s

Grid current bias operation without A.G.C. Oscillator voltage injected into grid 1.

Pentode

Supply Voltage	V _b	200	V
Anode Voltage (Decoupling Resistance, R _a =5.6kΩ)	V _a	155	V
Screen Grid Voltage (R _{g2} =39kΩ)	V _{g2}	108	V
Grid 1 Resistance	R _{g1}	0.1	MΩ
Grid 1 Current	I _{g1}	24	μA
Anode Current (approx.)	I _a	8.1	mA
Screen Grid Current (approx.)	I _{g2}	2.4	mA
Conversion Conduction at 1 Mc/s (V _{het(pk)} =2.8V)	g _c	4.9	mA/V

Triode

Anode Voltage	V _a	100	V
Anode Current	I _a	5	mA

