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Group : Ibrape S.A., Brasil - Application Laboratory.
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PHILIPS ELECTRON TUBE DIVISION
INDUSTRIAL COMPONENTS AND MATERIALS DIVISION

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ELECTRONIC APPLICATION LABORATORY REPORT [BI 005]

Br 6104

GROUP: IBRAPE, S.A. - BRASIL - APPLICATION LABORATORY

AUTHOR: C. C. Hoo B. Sc.

DATE: Jan. 3rd, 1961

TITLE: TYPICAL DATA OF A RC COUPLED OC 71 TRANSISTOR AMPLIFIER

SUMMARY

In this report, the performance of a single stage OC 71 RC coupled transistor amplifier is investigated. The measurements are made with different D.C. supply voltages from 3 volts to 24 volts. The measuring results are including the following items:

a) The optimum collector currents coresponding to different load resistance.
b) The maximum output voltage without clipping.
c) The voltage gain.
d) The input impedances with open and short circuited output.
e) The high cutoff frequencies.
f) The by-pass capacitance at the emitter coresponding a low cutoff frequency of 100 c/s.

The arthor is very grateful for Mr. Toshiwo Yoshikai, who is a student of the "Instituto Tecnologico de Aeronautica", had actually carried on the measurements of the charts in this report, during his practising in this laboratory.

C. C. Hoo

1. THE MEASURING METHODS

1.1 The Operating Voltages:

The operating voltages are from 3 volts to 24 volts divided into the following grades:

3, 4.5, 6, 9, 12, 18 and 24 volts

1.2 The load resistances:

The load resistances are chosen in standard R.M.A. values. The highest values are chosen to have a high cutoff frequency higher than 5,000 c/s. The lowest values are chosen so that the high cutoff frequency higher than 16,600 c/s. These load resistances are typical examples which enable the circuit designer to have a rough idea of frequency limits. The measurements are made with a VTVM to prevent loading effects to the output. The input is connected to a very low impedance signal source. Another limit for the minimum load resistance is the collector current, it is always less than 10 mA.

1.3 The optimum collector currents:

The optimum collector currents are measured in the manner so that the clipping of a sine-wave 1000 c/s signal is symetric to both peaks. During this measurement, a signal source of high impedance (100 kΩ) is used. The high source impedance prevents the distortion at high level which is caused by the non-linearity of the input impedance of the transistor.

1.4 The maximum Output Voltages:

The Maximum output voltages are measured with the above optimum collector currents. It is the rms value just before the clipping occurs. The distortion is beleived to be less than 1 % when a high source impedance is applied. When the source impedance is low, distortion is increased (mainly the second harmonic distortion).

1.5 The Voltage Gain:

The voltage gain is measured in a output level of about 100 mV.

1.6 The High Cutoff Frequencies:

The high cutoff frequencies are measured also ot a very low level. It is the frequencie 3 db below the middle range frequency response.

1.7 The Input Impedances:

The input impedances of the amplifiers are mesured in two values for each case, one is of open-circuited output and the other is the value of the short-circuited output. The measurements are made with a variable resistor and a very low source impedance generator in series with the input of the transistor, adjust the resistor so that the voltage at the input of the transistor is dropped to half of the values when the series resistor was completely shorted. The resistance of this variable resistor is considered to be the input impedance of the transistor. The measuring signal is a 1,000 c/s voltage with very small level in order to maintain the transistor working in its linear portion. This input impedance does not includethe shunt effect of the voltage divider at the base.

1.8 The emitter by-pass capacitances:

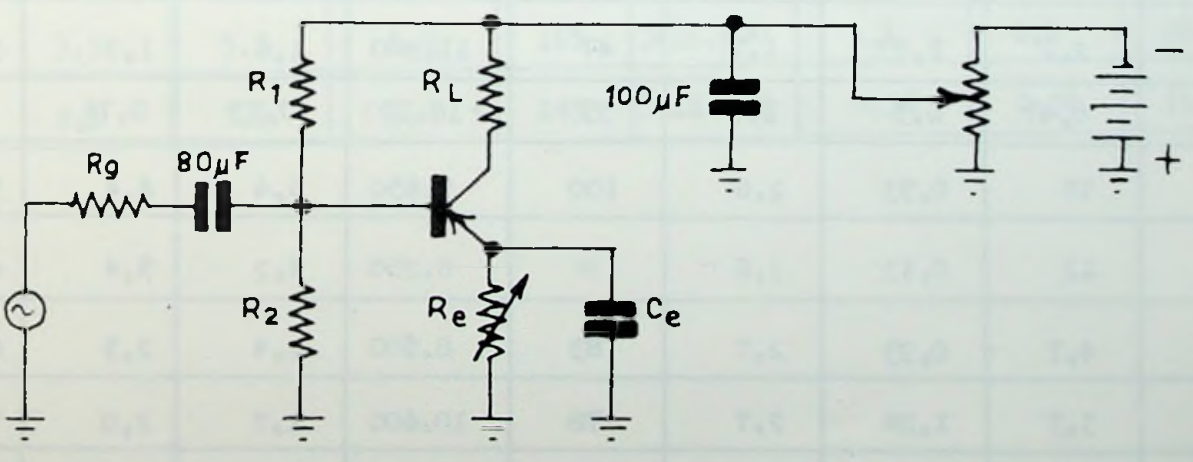
The emitter capacitor is adjusted so that a 100 c/s signal dropped to -3 db of the level of those frequencies in the middle range of the response. The measuring level is low.

2. THE SYMBOLS USED IN THE CHARTS

B	D.C. supply voltage, in volts
R_L	Load resistance at the collector, in kiloomhs
I_c	Optimum collector current, in miliamperes
V_o	Maximum output voltage without distortion, in volts
G_v	Voltage gain, in times
f_h	high cutoff frequency
R_i abert	Input impedance when output is open-circuited
R_i curto	Input impedance when output is short-circuited (A.C. only)
C_e	Emitter by-pass capacitance to give -3 db at 100 c/s.

THE CIRCUIT AND VALUES OF COMPONENTS USED

B (volts)	R_L (kΩ)	R_1 (kΩ)	R_2 (kΩ)
3,0	10, 6,8, 3,3, 1	47	10
3,0	0,22	22	47
4,5	12, 6,3, 4,7, 1,5	56	12
4,5	0,22	22	47
6,0	15, 10, 5,6, 2,2	56	10
6,0	0,47	56	33
9,0	18, 12, 4,7, 3,3	82	18
9,0	0,47	56	33
12,0	22, 12, 8,2, 4,7	100	18
12,0	1	100	22
18,0	22, 12, 6,8, 4,7, 1,5	100	22
24,0	22, 15, 6,8, 3,3, 2,2	100	18



CARACTERÍSTICAS TÍPICAS DO TRANSISTOR OC 71 COMO AMPLIADOR R-C

B (volts)	R_L (kΩ)	I_C (mA)	V_o (volts)	G_v	f_h (c/s)	R_i aberto (kΩ)	R_i curto (kΩ)	C_e (microf)
3,0	10	0,16	0,69	52	5.650	4,9	5,6	3,5
3,0	6,8	0,21	0,69	54	6.250	3,9	3,3	4,5
3,0	3,3	0,36	0,69	50	8.500	2,3	2,0	6,5
3,0	1	1,20	0,70	27	10.600	1,8	2,0	7,0
3,0	0,22	6,0	0,70	17	>16.600	0,73	0,73	125
4,5	12	0,23	1,1	59	6.200	6,9	7,2	3,3
4,5	6,8	0,37	1,1	58	8.700	4,5	6,1	4,6
4,5	4,7	0,49	1,2	40	11.200	4,3	4,1	5,6
4,5	1,5	1,25	1,2	34	12.600	1,9	1,9	7,8
4,5	0,22	9,5	1,2	19	>16.600	0,63	0,63	125
6,0	15	0,28	1,5	83	6.200	6,6	7,2	3,4
6,0	10	0,33	1,6	70	7.600	6,0	6,6	4,7
6,0	5,6	0,55	1,6	59	10.300	3,2	4,1	5,1
6,0	2,2	1,23	1,7	47	11.300	1,6	1,9	9,1
6,0	0,47	6,3	1,7	35	>16.600	0,73	0,76	115
9,0	18	0,33	2,6	100	5.650	5,4	6,4	3,5
9,0	12	0,43	2,6	96	6.250	4,2	5,4	4,5
9,0	4,7	0,93	2,7	83	8.500	2,4	2,5	6,5
9,0	3,3	1,28	2,7	78	10.600	1,7	2,0	7,0
9,0	0,47	8,8	2,7	39	>16.600	0,62	0,64	125

CARACTERÍSTICAS TÍPICAS DO TRANSISTOR OC 71 COMO AMPLIADOR R-C

B (volts)	R_L (kΩ)	I_C (mA)	V_o (volts)	A_v	f_h (c/s)	R_i aberto (kΩ)	R_i curto (kΩ)	C_e (microf)
12,0	22	0,26	3,3	144	5.500	4,9	5,6	1,3
12,0	12	0,45	3,5	130	7.000	3,0	3,3	3,7
12,0	8,2	0,65	3,6	120	8.000	2,5	3,0	4,6
12,0	4,7	1,1	3,8	98	9,500	1,8	2,0	5,6
12,0	1	6,5	3,6	72	>16.600	0,73	0,77	112
18,0	22	0,33	4,5	173	5.000	4,0	4,8	3,0
18,0	12	0,63	4,6	148	6.300	2,8	3,3	4,4
18,0	6,8	1,13	4,6	132	7.800	2,0	2,3	5,1
18,0	4,7	1,38	4,6	118	8.800	1,6	1,9	5,6
18,0	1,5	7,0	4,6	110	>16.600	0,68	0,73	112
24,0	22	0,50	6,0	400	5.000	3,1	3,6	3,7
24,0	15	0,75	6,0	230	6.800	2,4	2,7	4,6
24,0	6,8	1,53	6,0	180	8.000	1,5	1,7	6,0
24,0	3,3	3,8	6,0	165	>16.600	1,1	1,2	80
24,0	2,2	5,5	6,0	143	>16.600	0,36	0,36	112