NEC

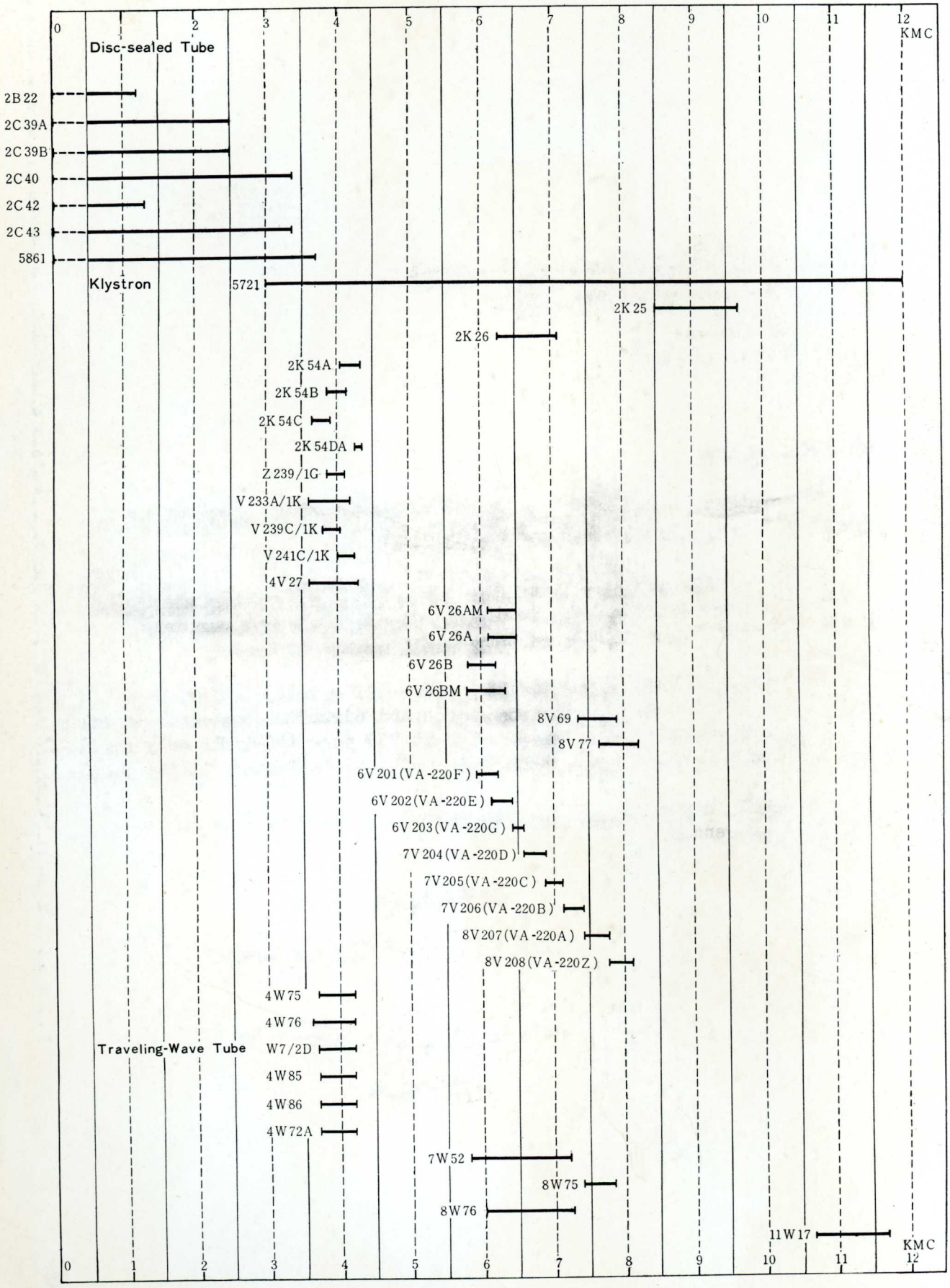
NEC MICROWAVE TUBES

Nippon Electric Company Ltd.

NEC MICROWAVE TUBES

OPERATING FREQUENCY RANGE

(in KMC)



VES - 3379

22 Sept. '62

TRAVELING WAVE TUBES

NIPPON ELECTRIC CO., LTD.
TOKYO, JAPAN.

Type	Description App: Du.Cy	Frequency (kmc)	Heater V;A	Helix V	Foc.Fld. (Gauss)	Gain (db)	Noise Fig. (db)	Power Output
4W72A	Ampl, CW	3.6 - 4.3	6.3, 1	2.92K	300	20		3W
4W75A	Ampl, CW	3.6 -4.3	6.3, 1	3K	ppm	23		2W
4W76A	Ampl, CW	3.6 -4.3	6.3,1.2	3.19K	ppm	30	27	10W
4W80	Ampl, CW	3.6 -4.3	6.3,0.74	3.1K	ppm	30	26	20W
4W85	Ampl, CW	3.7 -4.2	6.3,1.5	1.13K	400	24		20mW
4W86A	Ampl, CW	3.7 -4.2	6.3,1.5	2.03K	400	12		1.5W
6W50	Ampl, CW	5.8 -6.5	6.3,1.1	3.3K	ppm	30	27	10W
8W76A	Ampl, CW	6 - 7.5	6.3, 1	3K	ppm	30	27	5W
11W17A	Ampl, CW	10.7-11.7	6.3, 1	2K	ppm	30	27	1W
LD-418	Lw.noise	5.8-6.5	6.3,0.5	850	850	25	7	15mW
LD-513	Ampl, CW	5.8-6.5	6.3,0.75	3.5K	ppm	30	27	20W
LD-550A	Ampl, CW	5.8-8.2	6.3,0.73	3.4K	ppm	30	25	10W
LD-570	Lw. noise	2.1-2.9	5, 0.7	450	650	32	5.5	3mW
LD-571	Lw. noise	8.5-9.5	5, 0.7	840	700	23	6	2.4mW

K L Y S T R O N S

22 Sept. '62.

Nippon Electric Co., Tokyo, Japan

Type	Description App; Du. Cy.	Frequency (Kmc)	Heater V; A	Beam V; A	Refl V	Tun Range	Power Output.
2K25	refl	8.5 -9.66	6.3, 0.44	300, 0.025	-180	40mc	35mW
2K26	refl	6.25 -7.06	6.3, 0.44	300, 0.025	-115	50mc	100mW
2K54A	refl	4.05 - 4.3	6.3, 0.45	400, 0.025	-350		500mW
2K54B	refl	3.85 - 4.1	6.3, 0.45	400, 0.025	-350		500mW
2K54C	refl	3.65 - 3.9	6.3, 0.45	400, 0.025	-350		500mW
2K54DA	refl	4.25-4.35	6.3, 0.45	250, 0.012	-160	35mc	50mW
5V553	refl	4.8 - 5.1	6.3, 0.44	300, 0.025	-220		150mW
6V26AM	refl	6.1 - 6.5	6.3, 0.44	300, 0.025	-100	50mc	100mW
5976	refl	6.2 -7.425	6.3, 0.44	300, 0.025	-110	60mc	120mW
5721	refl	4 - 11	6.3, 0.58	1k, 0.02	-150		100mW
4V27	refl	3.5 - 4.5	6.3, 0.675	325, 0.025	-180		150mW
6V200	refl	6.225-6.325	6.3, 0.76	750, 0.070	-130	50mc	300mW
6V201	refl	5.925-6.225	6.3, 0.76	750, 0.070	-330	35mc	1.2 W
6V202	refl	6.125-6.425	6.3, 0.76	750, 0.070	-330	35mc	1.2 W
6V203	refl	6.425-6.575	6.3, 0.76	750, 0.070	-330	35mc	1.2 W
7V204	refl	6.575-6.875	6.3, 0.76	750, 0.070	-330	35mc	1.2 W
7V205	refl	6.875-7.125	6.3, 0.76	750, 0.070	-330	35mc	1.2 W
7V206	refl	7.125-7.425	6.3, 0.76	750, 0.070	-330	35mc	1.2 W
8V207	refl	7.425-7.750	6.3, 0.76	750, 0.070	-330	28mc	1 W
8V208	refl	7.750-8.100	6.3, 0.76	750, 0.070	-330	23mc	1 W
6V211	refl	5.985-6.285	6.3, 0.44	300, 0.023	-100	40mc	35 mW
6V212	refl	6.285-6.585	6.3, 0.44	300, 0.023	-100	40mc	35 mW
7V213	refl	6.585-6.705	6.3, 0.44	300, 0.023	-100	40mc	40 mW
7V214	refl	6.705-7.005	6.3, 0.44	300, 0.023	-100	40mc	40 mW
7V215	refl	6.955-7.255	6.3, 0.44	300, 0.023	-100	40mc	40 mW
7V216	refl	7.255-7.555	6.3, 0.44	300, 0.023	-100	40mc	40 mW
8V217	refl	7.550-7.850	6.3, 0.44	300, 0.023	-100	35mc	35mW

Type	Description App; Du. Cy.	Frequency (Kmc)	Heater V; A	Beam V; A	Refl V	Tun Range	Power Output
6V221	refl	5.925-6.225	6.3, 0.76	750, 0.070	-330	35mc	1.2W
6V222	refl	6.125-6.425	6.3, 0.76	750, 0.070	-330	35mc	1.2W
7V223	refl	6.425-6.575	6.3, 0.76	750, 0.070	-330	35mc	1.2W
7V224	refl	6.575-6.875	6.3, 0.76	750, 0.070	-330	35mc	1.2W
7V225	refl	6.875-7.125	6.3, 0.76	750, 0.070	-330	35mc	1.2W
7V226	refl	7.125-7.425	6.3, 0.76	750, 0.070	-330	35mc	1.2W
8V227	refl	7.425-7.750	6.3, 0.76	750, 0.070	-330	28mc	1.0W
8V228	refl	7,750-8.100	6.3, 0.76	750, 0.070	-330	23mc	1.0W
8V69	refl	7.350-7.850	6.3, 0.44	300, 0.025	-110	50mc	80mW
8V77	refl	7.650-8.200	6.3, 0.44	300, 0.025	-100	40mc	60mW
LD-588	refl	7.050-7.550	6.3, 0.44	300, 0.025	-80	40mc	60mW
9V54	refl	8.200-9.600	6.3, 0.45	450, 0.050	-270	40mc	350mW
10V54	refl	9.400-10.700	6.3, 0.45	450, 0.050	-190	65mc	250mW
10V13	refl	8.100-12.400	6.3, 0.45	500, 0.055	-300	65mc	350mW
11V53	refl	10.700-11.700	6.3, 1.1	300, 0.028	-180	40mc	70mW
11V53A	refl	10.700-11.700	6.3, 1.1	450, 0.050	-260	50mc	250mW
11V54	refl	10.700-11.700	6.3, 0.45	300, 0.028	-180	43mc	90mW
11V54A	refl	10.700-11.700	6.3, 0.45	450, 0.050	-260	50mc	250mW
11V55	refl	10.700-11.700	6.3, 0.45	500, 0.065	-260	70mc	450mW
LD-561	refl	11.700-12.440	6.3, 0.45	400, 0.045	-220	60mc	200mW
LD-554 (11V64)	refl.	10.700-11.700	6.3, 0.5	450, 0.050	-260	50mc	250mW
22V20	refl	21.000-23.800	6.3, 1.8	600, 0.040	-430	40mc	50mW
24V20	refl	22.500-24.500	6.3, 1.6	600, 0.040	-460	50mc	50mW
35V20	refl	33.000-37.000	6.3, 1.6	600, 0.038	-380	64mc	25mW
VA-800	CW ampl	1.700-2.400	Bomb. Type	16KV, 2	Gain 55db		10KW
VA-802B	CW ampl	1.700-2.400	6.0, 7.8	6KV, 0.55	Gain 50db		1KW

VES-3381

22 Sept. '62.

Magnetron

Nippon Electric Co.,Ltd. Tokyo, Japan.

Type	Description Du. Cy	Frequency (KMC)	Heater V: A	Anode KV: mA	Pull Fac. (mc/s)	Pls. Dur: (μs)	Power Output (KW)
2J42	OSC, .002	9.345-9.405	6.3, 0.53	55, .9	15	1	7
6027	do, .001	9.345-9.405	6.3, 0.53	6.9,7.5	15	1	18
2J42H	do, .00036	9.345-9.405	6.3, 0.53	5.275,1.62	20	0.45	7
2J49	do, .001	9 - 9.16	6.3, 1	12, 12	15	1	50
2J50	do, .001	8.75 - 8.9	6.3, 1	12, 12	15	1	50
2J55	do, .001	9.345-9.405	6.3, 1	12, 12	15	1	50
725A	do, .001	9.345-9.405	6.3, 1	12, 12	15	1	50
6406A	do, .0006	2.85 - 2.91	8.3, 79	52, 51	10	2	2000
5795	do, .002	3.1 - 3.5	107,3.65	46, 90	10	1.33	1000
6249B	do, .001	8.5 - 9.6	9, 14.2	28, 25	15	2.5	250
25M10	do, .0006	24.5 - 24.7	5, 2.9	14, 9	30	0.15	40

Disc-Sealed Tubes

Type	Description	Frequency (KMC)	Heater V: A	Anode (max.) (V)	Ampl. Fac.	Max. Diss. (W)	Power Output (W)
2B22	diode, det	1.2	6.3, 0.75	150	--	--	--
2C39A,B*	Tri. Ampl.	2.5	6.3, 1	1000	100	100	15 (2.5Kmc)
2C40	do.	3.37	6.3, 0.75	500	35	6.5	0.075 (3.37Kmc)
2C43	do.	3.37	6.3, 0.9	3500△	48	12	1000△ (3.37Kmc)
5861	do.	3.7	6.3, 0.4	350	30	10	0.5 (3 Kmc)
2C46	do.	1.3	6.3, 0.75	500	65	12	--
LD-497	do.	2.5	6.3, 1.3	1000	90	130	26 (2.5Kmc)
LD-583*	do.	2.5	6.3, 1.3	1000	90	130	26 (2.5Kmc)
LD-509*	do.	2.5	6.3, 1.3	1300	100	150	50 (2.5Kmc)
LD-531*	do.	2.3	6.3, 2.3	2000	130	600	100 (2.2Kmc)
LD-551*	do.	2.0	6.3, 3.6	3000	110	2100	300 (2 Kmc)

* Ceramic Sealed

△ Plate pulsed

TRAVELING WAVE TUBES, KLYSTRON AND BROAD-BAND AMPLIFIER TUBE.

13 JULY. '63

NIPPON ELECTRIC CO, LTD
TOKYO JAPAN

TRAVELING WAVE TUBES. (CW AMPLIFIER)

TYPE	FREQUENCY(MC)	HEATER (V)	HEATER (A)	HELIX (V)	COLLECTOR (V)	COLLECTOR (A)	FOC. FIELD	GAIN (db)	NOISE FIG	P. OUT
LD-637	1700~2300	6.3	1.05	2400	2000	50 mA	PPM	30	--	20W
LD-597A	3600~4200	6.3	0.7	2800	1700	35 mA	PPM	33	27	16W
6W51	5850~6450	6.3	0.6	3400	2000	40 mA	PPM	40	27	20W
ECL-1148	5850~6450	6.3	0.45	870	1200	460 μA	SOL	24	6.5	10mW
LD-550B	7200~8500	6.3	0.6	3200	1600	35 mA	PPM	40	27	10W
LD-615	10700~11700	6.3	0.4	2400	2500	10 mA	PPM	30	--	1W

KLYSTRON (REFLEX KLYSTRON)

				BEAM	P.OUT
6V26AMR	6100~6500	6.3	0.44	300 V 25 mA	100 (mW)

BROAMR-BAND AMPLIFIER

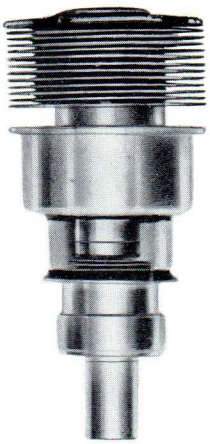
6B-P24 BROAD-BAND PULSE AMPLIFIER TUBE.

HEATER (V)	HEATER (A)	PLATE (V)	PLATE (A)	SCREENGRID (V)	SCREENGRID (A)	gm	μ	P.OUT
6.3	0.6	170	80mA	170	25mA	20mσ	10	1W

(RK=110Ω , Esig = 2.5Vac , RL=600Ω)

2C39A

UHF/VHF TRIODE (GLASS-TO-METAL DISC-SEALED)



GENERAL CHARACTERISTICS

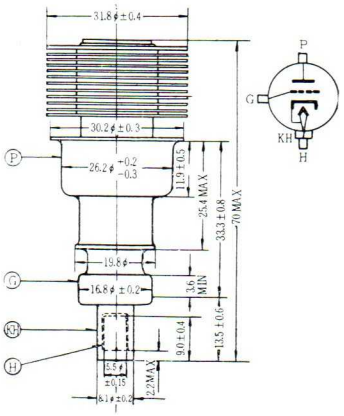
Cathode	Oxide-coated, indirectly heated
Heater Voltage	6.3 Volts
Heater Current	1.0 Ampere
Mutual Conductance	24,000 μMhos
Amplification Factor	100
Interelectrode Capacitance	
Grid to Plate	1.9 $\mu\mu$F
Grid to Cathode	6.5 $\mu\mu$F
Plate to Cathode	0.035 $\mu\mu$F max.

MAXIMUM RATINGS

Plate Voltage	1,000 Volts
Plate Current	125 Milliamperes
Plate Dissipation	100 Watts
Frequency	2,500 Mc
Seal Temperature	175°C

COOLING

Anode and Anode Seal	Conduction and Forced Air Cooling
Grid and Cathode Seal	As above



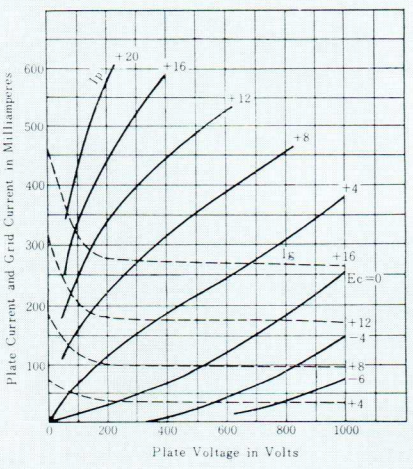
STRUCTURAL FEATURES

A. Low lead inductance effected by the disc-seal construction.
B. Small interelectrode capacitance and high transconductance due to planar electrode construction.
C. 100 watts dissipation can be tolerated with forced-air cooling of the radiator through a suitable cowling.
D. Complete enclosure of electromagnetic field to avoid possible radiation loss.
E. Silver-plated finish to reduce radio frequency resistance loss.

TYPICAL OPERATING DATA

CW Oscillator at 2,500 Mc

D.C. Plate Voltage	900 Volts
D.C. Plate Current	90 Milliamperes
D.C. Grid Current	25 Milliamperes
Power Output	15 Watts
D.C. Grid Voltage Approx.	−22 Volts



NOTICE

1. All contacting external parts should be silver plated or, if this is impossible, should be kept clean.
2. Due to transit time effects of the electron current, there is an optimum heater voltage for different frequencies. Recommended values are as follows,

Below	400 Mc	6.3 Volts	1,500 to	2,000 Mc	5.0 Volts
400 to	1,000 Mc	6.0 Volts	Above	2,000 Mc	4.5 Volts
1,000 to	1,500 Mc	5.5 Volts			

   All heater voltages must be kept within plus or minus 5% of the above values.
3. Glass-to-metal sealed parts must be kept below 175°C. Recommended air flow on anode radiator at sea level is 0.34 m³/min.

2C39B

* UHF/VHF TRIODE (CERAMIC-TO-METAL DISC-SEALED)

GENERAL CHARACTERISTICS

Cathode — Oxide-coated, indirectly Heated

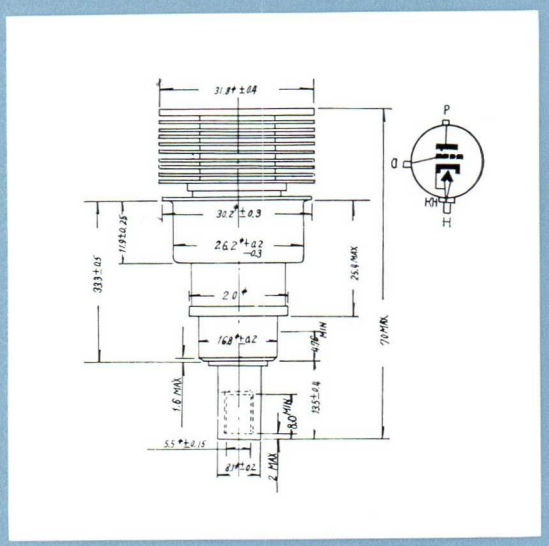
Heater Voltage	6.3 Volts
Heater Current	1.0 Ampere
Mutual Conductance	24,000 μMhos
Amplification Factor	100
Interelectrode Capacitances	
Grid to plate	1.9 $\mu\mu$F
Grid to Cathode	7.0 $\mu\mu$F
Plate to Cathode	0.035$\mu\mu$ F max.

MAXIMUM RATINGS

Plate Voltage	1,000 Volts
Plate Current	125 Milliamperes
Plate Dissipation	100 Watts
Frequency	2,500 Mc
Seal Temperature	200°C

COOLING

Anode and Anode Seal	Conduction and Forced Air Cooling
Grid and Cathode Seal	As above



STRUCTURAL FEATURES

A. Ceramic seal to allow operation at higher ambient temperatures.

B. Low lead inductance effected by the disc-seal construction.

C. Small interelectrode capacitance and high transcondutance due to planar electrode construction.

D. 100 watts dissipation can be tolerated with forced-air cooling of the radiator through a suitable cowling.

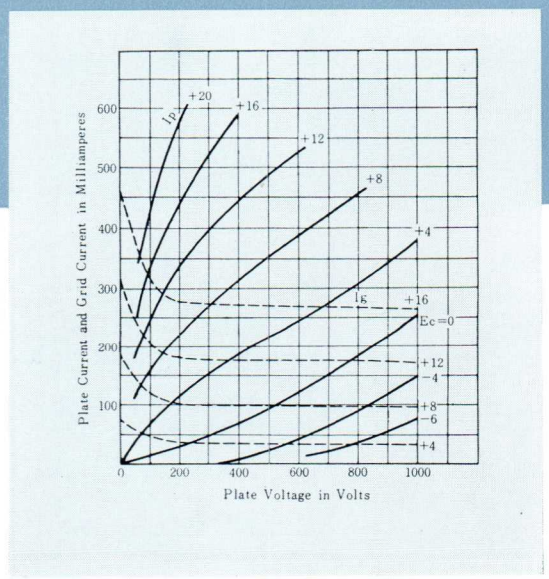
E. Complete enclosure of electromagnetic field to avoid possible radiation loss.

F. Silver-plated finish to reduce radio frequency resist ance loss.

TYPICAL OPERATING DATA

CW Oscillator at 2,500 Mc

D.C. Plate Voltage	900 Volts
D.C. Plate Current	90 Milliamperes
D.C. Grid Current	25 Milliamperes
Power Output	15 Watts
D.C. Grid Votage Approx.	−22 Volts



NOTICE

1. All contacting external parts should be silver plated or, if this is impossible, should be kept clean.
2. Due to transit time effects of the electron current, there is an optimum heater voltage for different frequencies. Recommended values are as follows,

Below	400 Mc	6.3 Volts	1,500 to	2,000 Mc	5.0 Volts
400 to	1,000 Mc	6.0 Volts	Above	2,000 Mc	4.5 Volts
1,000 to	1,500 Mc	5.5 Volts			

   All heater voltages must be kept within plus or minus 5% of the above values.
3. Ceramic-to-metal sealed parts must be kept below 200°C. Recommended air flow on anode radiator at sea level is 0.34 m³/min.

* In Preparation

NEC Nippon Electric Company Ltd.

2, Shiba Mita Shikoku-machi, Minato-ku, Tokyo, Japan
Tel. Tokyo 45-1171 (9) • 5121 (9) • 5221 (9)
Cable Address "MICROPHONE TOKYO"

Cat. No. 331173C-1

2C40

UHF TRIODE (DISC-SEALED)

GENERAL CHARACTERISTICS

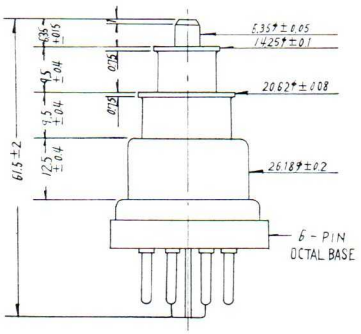
Cathode — Oxide-coated, indirectly heated
- Heater Voltage ..... 6.3 Volts
- Heater Current ..... 0.75 Amperes

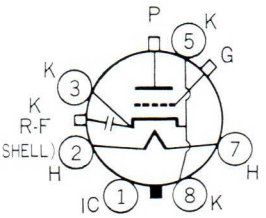
Mutual Conductance ..... 5,000 μMhos
Amplification Factor 35
Interelectrode Capacitances
- Grid to Plate ..... 1.3 $\mu\mu$F
- Grid to Cathode ..... 2.1 $\mu\mu$F
- Plate to Cathode ..... 0.05 $\mu\mu$F max.

MAXIMUM RATINGS

Plate Voltage ..... 500 Volts
Plate Current ..... 25 Milliamperes
Plate Dissipation ..... 6.5 Watts
- Duty Cycle ..... —
- Pulse Width ..... —
- Frequency ..... 3,370 Mc

Seal Temperature ..... 200°C



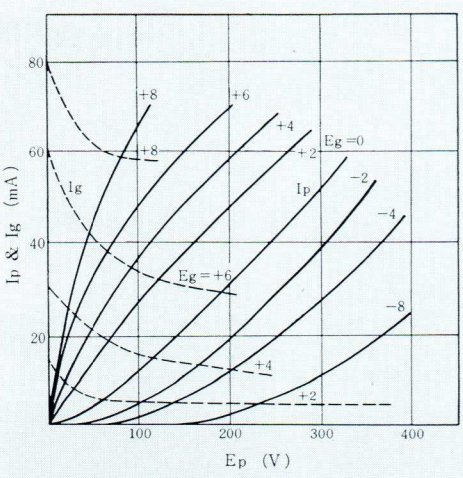


STRUCTURAL FEATURES

A. Low lead inductance effected by the disc-seal construction.
B. Small interelectrode capacitance due to planar electrode construction.
C. Effective cooling of anode cap through lead-in structure.
D. Complete enclosure of electromagnetic field to avoid possible radiation loss.
E. Silver-plated finish to reduce radio frequency resistance loss.

TYPICAL OPERATING DATA

	CW Oscillator at 2,000 Mc	CW Oscillator at 550 Mc	CW Oscillator at 3,370 Mc
D.C. Plate Voltage	150 Volts	250 Volts	250 Volts
D.C. plate Current	18 Milliamperes	16 Milliamperes	20 Milliamperes
D.C. Grid Current	2 Milliamperes	7 Milliamperes	0.3 Milliamperes
Power Output	100 Milliwatts	600 Milliwatts	85 Milliwatts
Grid Leak Resistance	750 Ohms	2,000 Ohms	10,000 Ohms



NOTICE

1. All contacting external parts should be silver plated or, if this is impossible, should be kept clean.
2. By-pass capacitors of not less than 100 $\mu\mu$F shall be used to minimize radio frequency leakage through lead-in connections.
3. Recommended value of seal temperature is below 175°C

2C43

UHF TRIODE (DISC-SEALED)

GENERAL CHARACTERISTICS

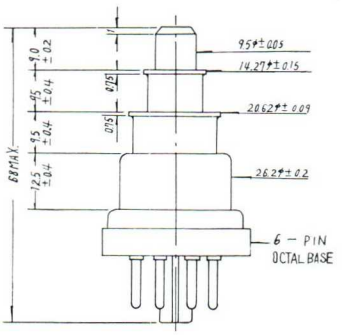
Cathode — Oxide-coated, indirectly heated
- Heater Voltage ..... 6.3 Volts
- Heater Current ..... 0.9 Amperes

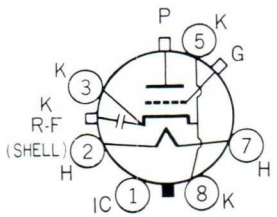
Mutual Conductance ..... 8,000 μ Mhos
Amplification Factor 48
Interelectrode Capacitances
- Grid to plate ..... 1.7 $\mu\mu$F
- Grid to Cathode ..... 2.8 $\mu\mu$F
- Plate to Cathode ..... 0.05 $\mu\mu$F max.

MAXIMUM RATINGS

Peak Plate Voltage ..... 3,500 Volts
Peak Cathode Current ..... 4 Amperes
Plate Dissipation ..... 12 Watts
- Duty Cycle 0.006
- Pulse Width ..... 10 Microseconds
- Frequency ..... 3,370 Mc

Seal Temperature ..... 200°C



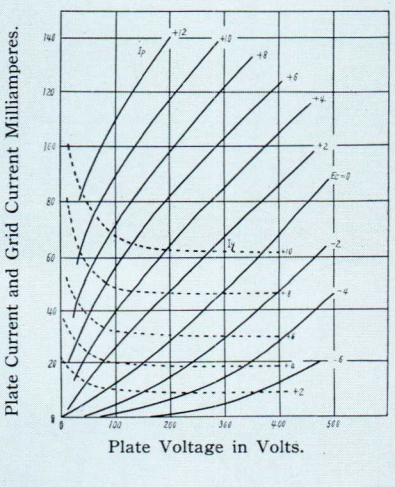


STRUCTURAL FEATURES

A. Low lead inductance effected by the disc-seal construction.
B. Small interelectrode capacitance due to planar electrode construction.
C. Effective cooling of anode cap through lead-in structure.
D. Complete enclosure of electromagnetic field to avoid possible radiation loss.
E. Silver-plated finish to reduce radio frequency resistance loss.

TYPICAL OPERATING DATA

CW Oscillator at 2,000 Mc		Average Output	2.5 Watts
D.C. Plate Voltage	150 Volts	Grid Leak Resistance	100 Ohms
D.C. Plate Current	22 Milliamperes	Duty Cycle	0.1
D.C. Grid Current	2.9 Milliamperes	Pulse Width	0.5 Microsecond
Power Output	100 Milliwatts	Pulse Oscillator at 3,370 Mc	
Grid Leak Resistance	750 Ohms	Peak Plate Voltage	3,000 Volts
Pulse Oscillator at 2,000 Mc		Peak Plate Current	2 Amperes
Peak Plate Voltage	600 Volts	Average Power Output	1 Watt
Average Plate Current	35 Milliamperes	Grid Leak Resistance	100 Ohms
Average Grid Current	18 Milliamperes	Duty Cycle	0.001
		Pulse Width	1 Microsecond



NOTICE

1. All contacting external parts should be silver plated or, if this is impossible, should be kept clean.
2. By-pass capacitors of not less than 100 $\mu\mu$F shall be used to minimize radio frquency leakage through lead-in connections.
3. Recommended value of seal temperature is below 175°C.

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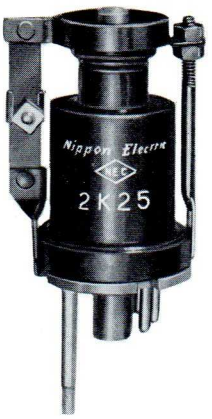
2K25

SHF REFLEX KLYSTRON

The type 2K25 is a reflex klystron operating over a frequency range of 8,500 to 9,660 Mc and delivering a power output of 20 mW (min.) at 9,370 Mc, 300 Volts on resonator.



STRUCTURAL FEATURES

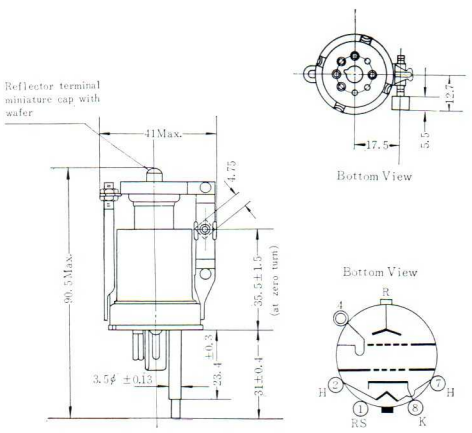
Integral cavity and full-range tuner, coaxial output line through base of tube designed for use with broad-band waveguide starting section.

GENERAL CHARACTERISTICS

Frequency Range ..... 8,500 to 9,660 Mc
Cathode Oxide-coated, indirectly heated
Heater Voltage ..... 6.3 Volts
Heater Current ..... 0.44 Amperes

MECHANICAL FEATURES

Resonant Cavity ..... Integral part of the tube
Envelope ..... Metal
Base ..... Small wafer, octal, 4 pins and coaxial output terminal
Weight ..... 45 g



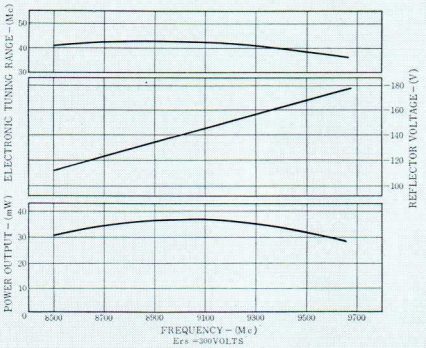
Note: Coaxial Output Line passes through vacant pin position No. 4

MAXIMUM RATINGS

Resonetor Voltage ..... 330 Volts
Resonetor Current ..... 37 Milliamperes
Heater Voltage ..... 5.8~6.8 Volts
Heater to Cathode Voltage ..... ±50 Volts
Reflector Voltage ..... 0 to −400 Volts

TYPICAL OPERATING DATA

Frequency 9,370Mc
Resonator Voltage ..... 300 Volts
Resonator Current ..... 25 Milliamperes
Reflector Voltage ..... −130 to −180 Volts
Reflector Current ..... Less than 1 Microampere
Electronic Tuning Range ..... 40 Mc
Power Output ..... 35 Milliwatts



NOTICE

1. The heater voltage must be applied one minute before resonator voltage is applied.
2. The reflector voltage must always be applied before resonator voltage.
3. The reflector must never become positive with respect to the cathode.

2K26

SHF REFLEX KLYSTRON

The type 2K26 is a reflex klystron operating over a frequency range of 6,250 to 7,060 Mc and delivering a power output of 80 mW (min.) at 6,660 Mc, 300 Volts on resonator.

STRUCTURAL FEATURES

Integral cavity and full-range tuner; coaxial output line through base of tube designed for use with broad-band waveguide starting section.

GENERAL CHARACTERISTICS

Frequency Range ..... 6,250 to 7,060 Mc
Cathode Oxide-coated, indirectly heated
Heater Voltage ..... 6.3 Volts
Heater Current ..... 0.44 Amperes

MECHANICAL FEATURES

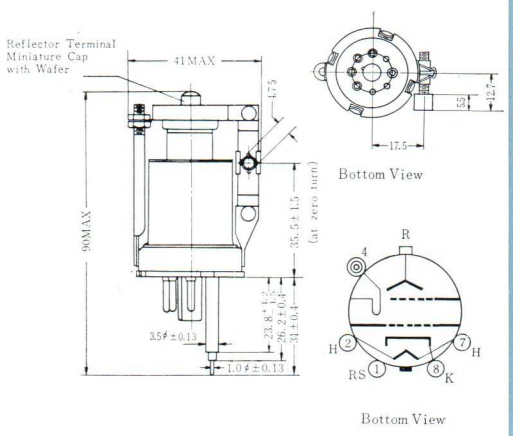
Resonant Cavity ..... Integral part of the tube
Envelope ..... Metal
Base ..... Small wafer, octal, 4 pins and coaxial output terminal
Weight ..... 45 g

MAXIMUM RATINGS

Resonator Voltage ..... 330 Volts
Resonator Current ..... 35 Milliamperes
Heater Voltage ..... 5.8 to 6.8 Volt
Heater to Cathode Voltage ..... ±50 Volts
Reflector Voltage ..... 0 to −350 Volts

TYPICAL OPERATING DATA

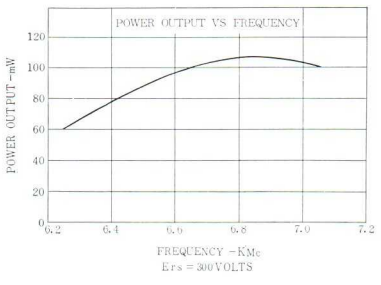
Frequency ..... 6,660 Mc
Resonator Voltage ..... 300 Volts
Resonator Current ..... 25 Milliamperes
Reflector Voltage ..... −70 to −115 Volts
Reflector Current ..... Less than 1 Microampere
Electronic Tuning Range ..... 50 Mc
Power Output ..... 100 Milliwatts

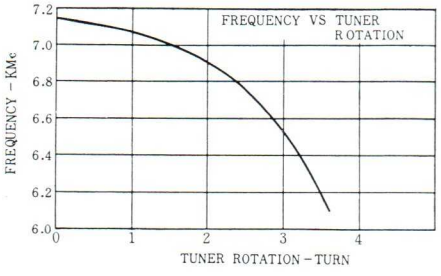


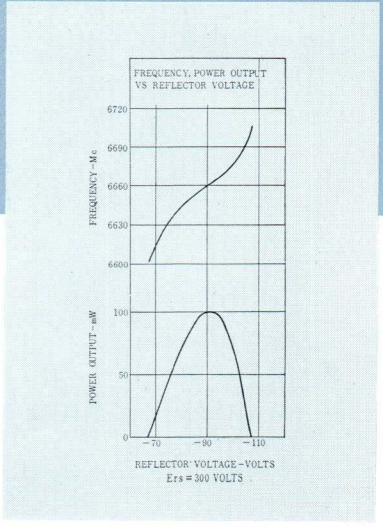
Note: Coaxial Output Line passes through vacant Pin Position No. 4

NOTICE

1. The heater voltage must be applied one minute before resonator voltage is applied.
2. The reflector voltage must always be applied before the resonator voltage.
3. The reflector must never become positive with respect to the cathode.







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Cat. No. 331173C-3

2K54A
2K54B
2K54C

SHF REFLEX KLYSTRON

The types 2K54A, 2K54B and 2K54C are reflex klystrons designed for use as oscillators in continuous service.

The type 2K54A klystron has an output not less than 300 mW over the full range between 4,050 and 4,300 Mc, while the type 2K54B operates similarly on the 3,850 to 4,100 Mc band and the type 2K54C on the 3,650 to 3,900 Mc band.

STRUCTURAL FEATURES

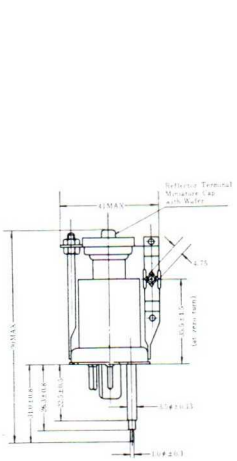
Integral cavity and full-range mechanical tuner; coaxial output line through base of tube designed for use with broadband waveguide starting section.

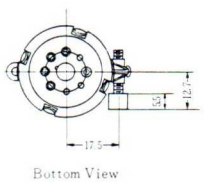
GENERAL CHARACTERISTICS

Frequency Range	2K54A : 4,050 to 4,300 Mc 2K54B : 3,850 to 4,100 Mc 2K54C : 3,650 to 3,900 Mc
Cathode	Oxide-coated, indirectly heated
Heater Voltage	6.3 Volts
Heater Current	0.45 Amperes

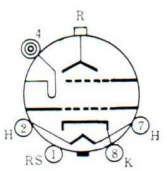
MECHANICAL FEATURES

Resonant Cavity	Integral part of the tube
Envelope	Metal
Base	Small wafer, octal, 4 pins and coaxial output terminal
Weight	50 g





Bottom View



Bottom View

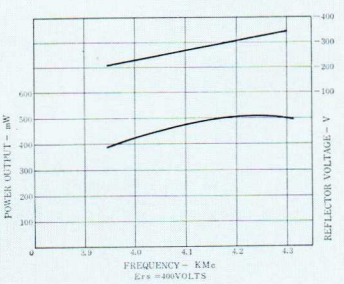
Note
Coaxial Output Line passes through vacant Pin Position No. 4

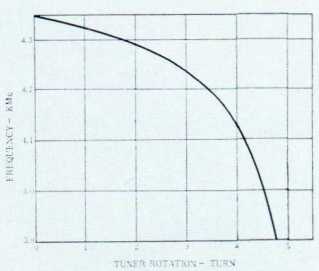
MAXIMUM RATINGS

Resonator Voltage	430 Volts
Resonator Current	35 Milliamperes
Heater Voltage	5.8 ~ 6.8 Volts
Heater to Cathode Voltage	±50 Volts
Reflector Voltage	0 to −450 Volts

TYPICAL OPERATING DATA 2K54A

Frequency	4,200 Mc
Resonator Voltage	400 Volts
Resonator Current	25 Milliamperes
Reflector Voltage	−250 ~ −350 Volts
Reflector Current	Less than 1 Microampere
Power Output	500 Milliwatts





NOTICE

1. The heater voltage must be applied one minute before resonator voltage is applied.
2. The reflector voltage must always be applied before the resonator voltage.
3. The reflector must never become positive with respect to the cathode.

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2K54DA

SHF REFLEX KLYSTRON

The type 2K54DA is a reflex klystron designed specifically for use as frequency deviator, operating over a frequency range of 4,250 to 4,350 Mc and delivering power output of not less than 30 milliwatts at 4,300 Mc. The electronic tuning range of 2K54DA is approximately 35 Mc.

STRUCTURAL FEATURES

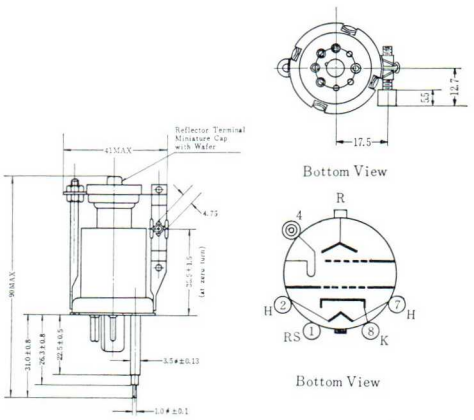
Integral cavity and full-range tuner; coaxial output line through base of tube designed for use with broadband waveguide starting section.

GENERAL CHARACTERISTICS

Frequency Range ..... 4,250 to 4,350 Mc
Cathode Oxide-coated, indirectly heated
Heater Voltage ..... 6.3 Volts
Heater Current ..... 0.45 Amperes

MECHANICAL FEATURES

Resonant Cavity ..... Integral part of the tube
Envelope ..... Metal
Base ..... Small wafer, octal, 4 pins and coaxial output terminal



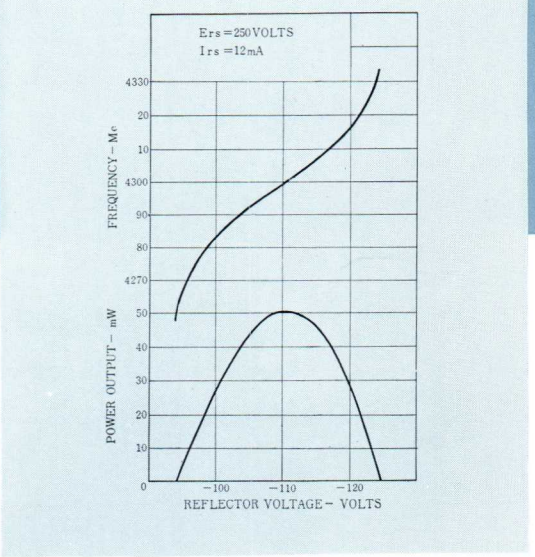
Note
Coaxial Output Line passes through vacant Pin Position No. 4

MAXIMUM RATINGS

Resonator Voltage ..... 330 Volts
Resonator Current ..... 35 Milliamperes
Heater Voltage ..... 5.8 ~ 6.8 Volts
Heater to Cathode Voltage ..... ±50 Volts
Reflector Voltage ..... 0 to −350 Volts

TYPICAL OPERATING DATA

Frequency ..... 4,300 Mc
Resonator Voltage ..... 250 Volts
Resonator Current ..... 12 Milliamperes
Reflector Voltage ..... −90 to −160 Volts
Reflector Current ..... Less than 1 Microampere
Electronic Tuning Range ..... 35 Mc
Modulation Sensitivity ..... 1.2 Mc/Volt
Power Output ..... 50 Milliwatts



NOTICE

1. The heater voltage must be applied one minute before resonator voltage is applied.
2. The reflector voltage must always be applied before the resonator voltage.
3. The reflector must never become positive with respect to the cathode.

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Cat. No. 331173C-4

NEC MICROWAVE TUBES

SHF TRAVELING WAVE TUBE

4W72A

The type 4W72 A is a traveling-wave tube designed for use with an electro-magnetic solenoid for CW operation over the 3,600 to 4,200 Mc range with an average small-signal gain of 20 db and a maximum power output of 3 watts. It is a conventional helical line type tube employing waveguide input and output coupling. 4W72 A has improved chracteristics of the input and output voltage standing-wave ratio.

GENERAL CHARACTERISTICS

Cathode	Oxide-coated, indirecty heated
Heater Voltage	6.3 Volts
Heater Current	1.0 Amperes

MAXIMUM RATINGS

1 st Anode Voltage	1,450 Volts
Helix Voltage (2 nd Anode Voltage)	3,150 Volts
Collector Voltage	3,200 Volts
Cathode Current	18 Milliamperes
1 st Anode Current	0.25 Milliamperes
Helix Current (2 nd Anode Current)	4 Milliamperes
Collector Seal Temperature	150°C

TYPICAL OPERATING DATA

Frequency	4,200 Mc
1 st Anode Voltage	1,160 Volts
Helix Voltage (2 nd Anode Voltage)	2,920 Volts
Helix Current (2 nd Anode Current)	0.6 Milliamperes
Collector Current	14 Milliamperes
R. F. Imput	25 Milliwatts
R. F. Output	1,850 Milliwatts
Focusing Field	300 Gauss

COOLING

Forced-air Cooling	0.12 m^3/min

OPERATIONAL SEQUENCE

When putting the 4W72 A into operation, initial adjustment should be performed in the following sequence:

1. Apply the recommended focusing field and supply the required air flow.
2. Applly heater voltage and allow one minute minimum warm up.
3. Apply 3,200 volts maximum to the collector; 3,000 volts to the helix (2 nd anode) in that order, then increase the 1 st anode voltage until the 4 mA cathode current is reached.
4. Adjust tube position relative to the focus coil so that colletor current is maximum and helix (2 nd anode) current is minimum.
5. Slowly increase the 1 st anode voltage to the rated cathode current.
6. Trim the tube position for proper current division.

MAGNETIC FIELD

Small variation of the magnetic field strength along the axis may be tolerated as long as the field distribution is symmetrical with respect to its axis. It is essential, however, that the axis of the tube and that of the magnetic field be coaxial, in any event.

WAVEGUIDES

Internal dimensions of the input and output coupling waveguide are as follows:

12.1 mm × 58.1 mm

The proper impedance matching of the tube and the guides will be obtained only if the terminations of the helix are correctly oriented relative to the guides.

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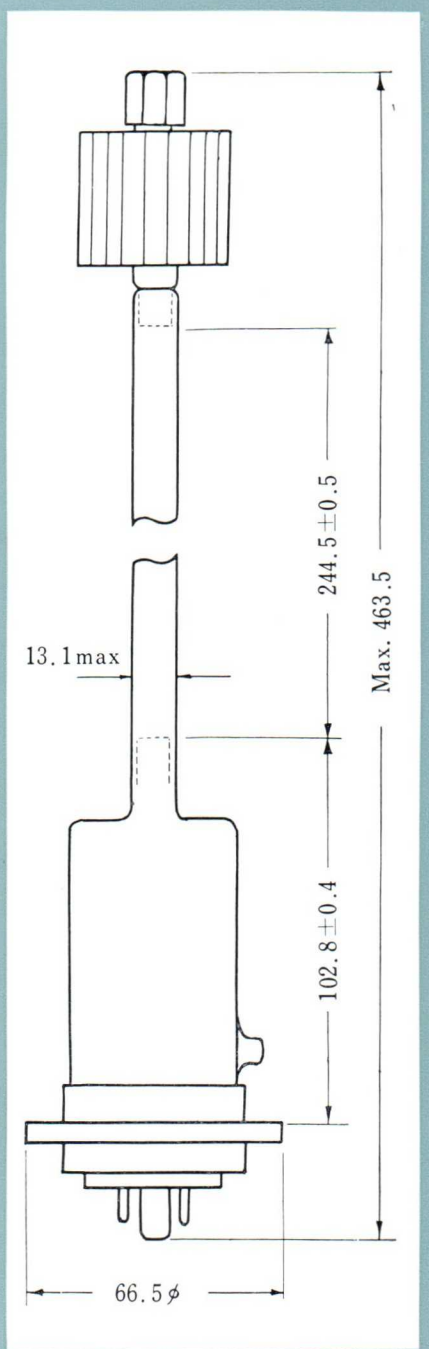
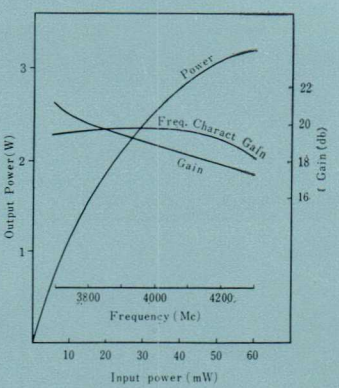
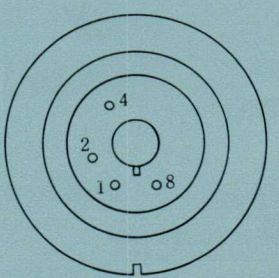


Characteristics





1. No Connection
2. Heater
4. 1 st Anode
8. Heater & Cathode

Side Cap. Helix

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Cat. No. 351173C-21

4W75

SHF PACKAGE-TYPE TRAVELING WAVE TUBE

The type 4W75 is a traveling wave amplifier and oscillator for C.W. operation over the 3,600 to 4,200 Mc range with an average small signal gain of 23 db and a maximum power output of around 2 watts. It is a conventional helical line type tube employing wave guide input and output coupling. The focusing system of this tube consists of special magnetic lenses and periodic-magnetic field system which are packaged in cylindrical cases together with input and output waveguides and the tube itself.

GENERAL CHARACTERISTICS

Cathode	Oxide-coated, indirectly heated
Heater Voltage	6.3 Volts
Heater Current	1.0 Amperes

MAXIMUM RATINGS

Focusing Electrode Voltage	−60 Volts
Ist Anode Voltage	1,800 Volts
Helix Voltage (2 nd Anode Voltage)	3,200 Volts
Collector Voltage	3,250 Volts
Cathode Current	18 Milliamperes
Ist Anode Current	250 Microamperes
Helix Current (2 nd Anode Current)	4 Milliamperes
Collector Seal Temperature	150°C

MECHANICAL CHARACTERISTICS

Mounting position	any
Volume of air required for cooling	0.12 m^3/min
Net weight	3.8 kgs.

TYPICAL OPERATING DATA

Frequency	4,200 Mc
Focusing Electrode Voltage	−50 Voltage
Ist Anode Voltage	1,500 Volts
Helix Voltage (2 nd Anode Voltage)	3,000 Volts
Helix Current (2 nd Anode Current)	1 Milliamperes
Cathode Current	15 Milliamperes
Collector Voltage	3,050 Volts
R.F. Output (at 10 mW input level)	1.8 Watts

PRECAUTIONS

1. Care should be taken to avoid shock damage to the tube and the input and output waveguides. For the installation of this tube, it is desirable to use flexible waveguide sections to which the tube is connected.
2. The screws used to fix the tube elements should never be moved.
3. The required air flow must always be supplied before any high voltages are applied to the tube.
4. The first anode voltage should not be applied before the focusing electrode, helix and collector voltages reach the specified values.
5. The tube body is connected to the collector electrode internally, so it is recommended that the body be kept at ground potential.

OPERATIONAL SEQUENCE

1. Bolt the tube securely to the mating waveguide flanges. Do not distort the tube capsule on mounting, to avoid damage of the glass envelope.
2. Apply heater voltage and allow one minute minimum warm up.
3. Apply the specified voltages to the focusing electrode, collector and helix voltages in that order.
4. Increase the 1st anode voltage until the rated cathode current is reached.
5. Trim the helix voltage for optimum operation.

TUNING PROCEDURE

Two short plungers provided in the input and output waveguides are used to tune the tube roughly to the external circuits.

When fine adjustment of impedance matching at input and output circuits is required, it is recommended that matching devices be used.

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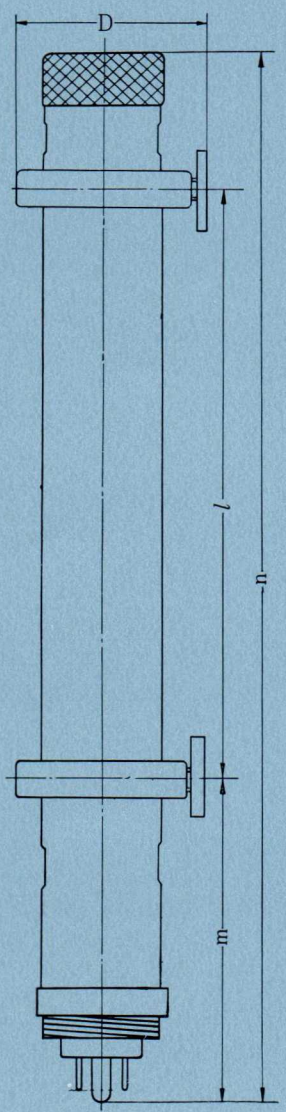
Unit mm

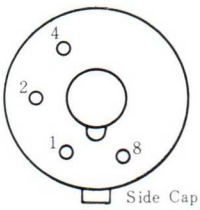


$l = 310 \pm 1$

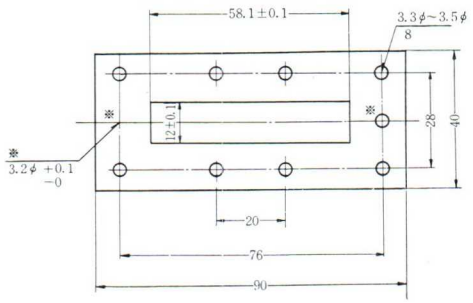
m = 138 max.

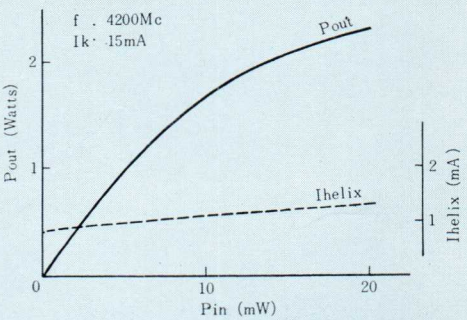
D = 80 max.

n = 530 max.



1. Focusing Electrode
2. Heater
4. 1 st Anode
8. Heater & Cathode





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4W76

SHF PACKAGE-TYPE TRAVELING WAVE TUBE

The type 4W76 is a traveling wave amplifier and oscillator in C. W. operation over the 3,600to 4,200 Mc range with an average small signal gain of 30 db and a maximum power output of around 10 watts. It is a conventional helical line type tube employing waveguide input and output coupling. The focusing system of this tube consists of a novel magnetic circuit and a conventional periodic magnetic field system which are packaged in cylindrical cases together with input and output waveguides and the tube itself, so the complete assembly is remarkably compact and light-weight.

GENERAL CHARACTERISTICS

Cathode	Oxide-coated, indirectly heated
Heater Voltage	6.3 Volts
Heater Current	1.2 Amperes

MAXIMUM RATINGS

Focusing Electrode Voltage	−50 Volts
1 st Anode Voltage	2,800 Volts
Helix Voltage (2 nd Anode Voltage)	3,450 Volts
Collector Voltage	3,500 Volts
Cathode Current	40 Milliamperes
1 st Anode Current	1 Milliampere
Helix Current (2 nd Anode Current)	4 Milliamperes
Collector seal Temperature	150°C

MECHANICAL CHARACTERISTICS

Mounting position	Any
Volume of air required for cooling	0.3 m^3/min
Net Weight	3 kgs.

TYPICAL OPERATING DATA

Frequency	4,200 Mc
Focusing Electrode Voltage	−40 Volts
1 st Anode Voltage	2,400 Volts
Helix Voltage (2 nd Anode Voltage)	3,190 Volts
Helix Current (2 nd Anode Current)	0.7 Milliamperes
Cathode Current	35 Milliamperes
Collector Voltage	3,240 Volts
R.F. Output (at 20 mW input level)	9.1 Watts

PRECAUTIONS

1. Care should be taken to avoid shock damage to the tube and the input and output waveguides. For the installation of this tube, it is desirable to use flexible waveguide section to which the tube is connected.
2. The screws used to fix the tube elements should never be moved.
3. The required air flow must always be supplied before any high voltages are applied to the tube.
4. The first anode voltage should not be applied before the focusing electrode, helix and collector voltages reach the specified values.
5. The tube body is connected to the collector electrode internally, so it is recommended that the body be kept at ground potential.

OPERATIONAL SEQUENCE

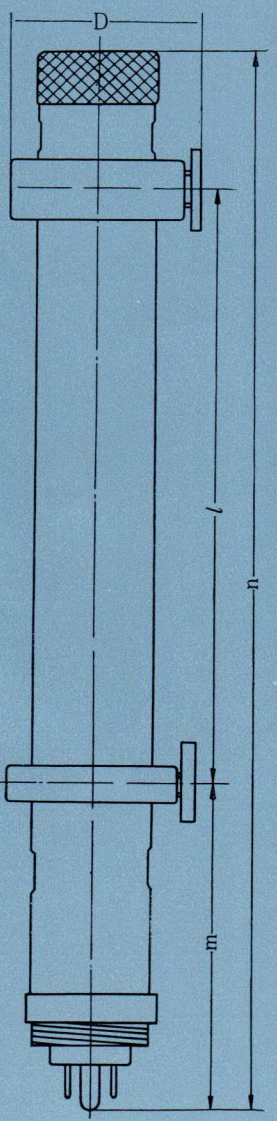
1. Bolt the tube securely to the mating waveguide flanges. Do not distort the tube capsule on mounting, to avoid damage of the glass envelope.
2. Apply heater voltage and allow 90 seconds minimum warm up.
3. Apply the specified voltages to the focusing electrode, collector and helix voltages in that order.
4. Increase the 1 st anode voltage until the rated cathode current is reached.
5. Trim the helix voltage for optimum operation.

TUNING PROCEDURE

Two short plungers provided in the input and output waveguides are used to tune the tube roughly to the external circuits.

When fine adjustment of impedance matching at input and output cricuits is required, it is recommended that matching devices be used.

Unit mm

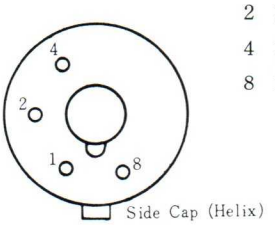


$l = 310 \pm 1$

m = 135 max.

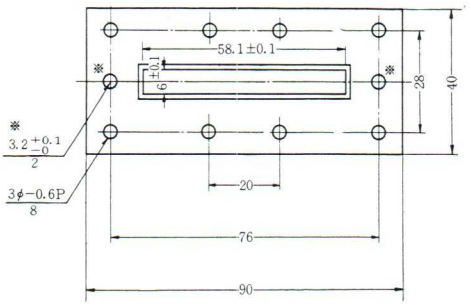
D = 80 max.

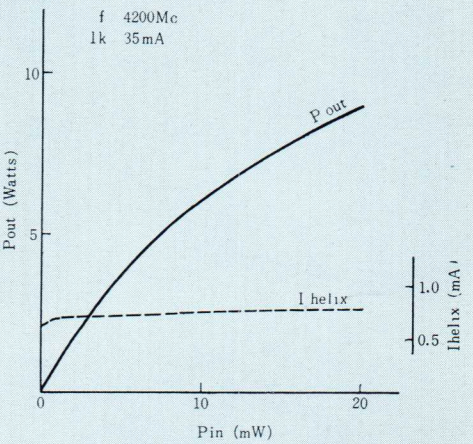
n = 520 max.



Side Cap (Helix)

1 Focusing Electrode
2 Heater
4 1 st Anode
8 Heater & Cathode





NEC Nippon Electric Company Ltd.

2, Shiba Mita Shikoku-machi, Minato-ku, Tokyo, Japan
Tel. Tokyo 45-1171 (9) • 5121 (9) • 5221 (9)
Cable Address "MICROPHONE TOKYO"

Cat. No. 331173C-6

TRAVELING-WAVE TUBE 4W80

GENERAL

The 4W80 is a CW traveling-wave amplifier designed for operation in a frequency range of 3.6 to 4.2 kMc. This tube has an average small signal gain of 30 db and a saturated output power of 18 watts. It is of conventional helical line construction employing input and output waveguide couplings. These couplings have integral tapered waveguide adapters with adjusting screws for impedance matching. The 4W80 uses integral permanent magnet focusing. It is convection-cooled, and operates with depressed collector electrode voltage. The latter feature produces significant improvement in the operating efficiency. The design, construction, and durability of the tube make it exceptionally well suited for use in point-to-point, broad-band, multichannel microwave relay equipment.

FEATURES

- Depressed collector operation for improved efficiency
- Convection-cooled
- PPM focused
- Durability

CHARACTERISTICS

Electrical

MAXIMUM RATINGS*

Accelerating anode voltage	3700 v
Accelerating anode current	1 ma
Helix voltage	3400 v
Helix current**	1.5 ma
Collector voltage, min.	2000 v
Collector current***	45 ma
Collector dissipation	90 w
Focusing electrode voltage	-75 v
Ambient temperature	55° c
Ambient temperature, min.	-55° c
Collector seal temperature	180° c

Physical

GENERAL

Dimensions	See outline drawing
Weight	11 lbs
Preferred mounting position****	Horizontal
Cathode	Oxide coated, unipotential
(Minimum heating time	90 sec)
Connections RF input and output	Reduced height WR229 (~~WDT~~ WRJ-4)

Operation

(HEATER VOLTAGE = 6.3v HEATER CURRENT AT 6.3v = 0.74a)

Frequency	3.7	4.0	4.2 kMc
Accelerating anode voltage	3100	3100	3100 v
Helix voltage	2900	2850	2770 v
Helix current	0.6	0.6	0.6 ma
Collector voltage	2000	2000	2000 v
Collector current	45	45	45 ma
Focusing electrode voltage	-30	-30	-30 v
RF output (10-mw input level)	11	13	12 w
RF saturated output	19	20	19 w
Noise figure (small signal)	27	27	27 db
Small signal gain (0.5-mw input)	33	33	33 db

NOTES:

* Ratings should not be exceeded under continuous or transient conditions. A single rating may be the limitation and simultaneous operation at another rating may not be possible. Design values for systems should include a safety factor to maintain operation within ratings under voltage and environmental variations.

** Helix current increases gradually with tube life. Impending termination of tube life is indicated when the helix current reaches 2.5 milliamperes.

*** No RF drive power should be used during installation and voltage adjustments of the tube. Under these conditions, brief excursions of the collector current up to 50 millamperes will not damage the tube.

**** Convection cooling is sufficient when the tube is used in a horizontal position. For any other mounting position it may be necessary to direct some air flow through the cooling fans in order to keep the collector seal temperature at a safe operating level.

MOUNTING

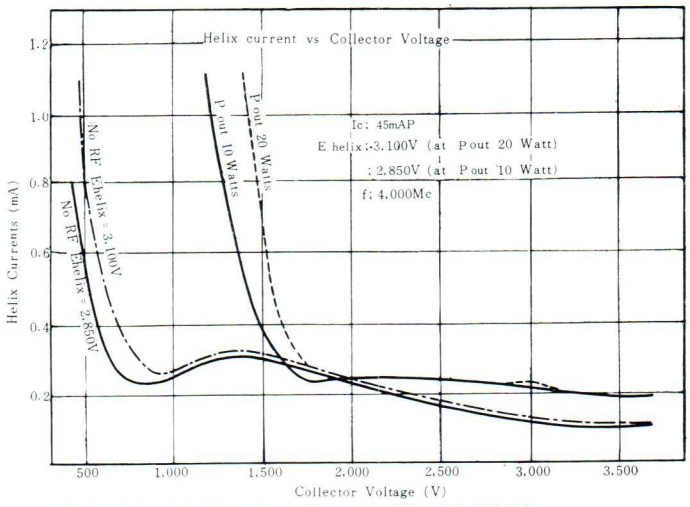
The optimum arrangement for mounting the 4W80 is to provide a mounting clamp in the center of the tube between the two waveguides, and then use flexible waveguides for the input and output connectors.

A satisfactory alternate arrangement is to use a fixed waveguide for the output connector, supporting the tube at this point, and then use a flexible waveguide for the input connector.

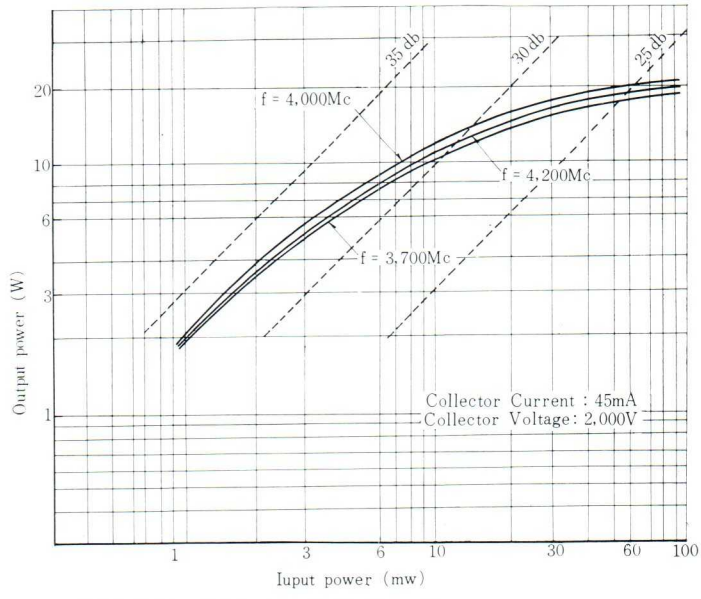
NEC

CHARACTERISTIC CURVES

ALL CURVES ARE OF AVERAGE VALUES

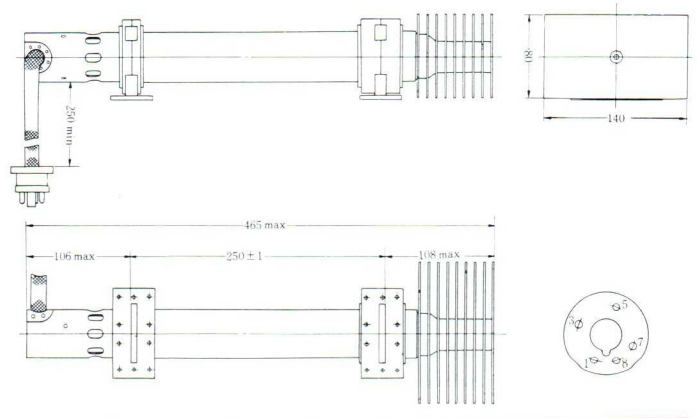


HELIX CURRENT vs. COLLECTOR VOLTAGE



OUTPUT POWER vs. INPUT POWER

OUTLINE DRAWING



1. HEATER
3. 1ST ANODE
5. HELIX
7. HEATER & CATHODE
8. FOCUSING ELECTRODE

NEC Nippon Electric Company Limited
P.O. Box 1, Takanawa, Tokyo, Japan
Cable Address: "MICROPHONE TOKYO"

Cat. No. 443-5-E
6208-1000-M
Printed in Japan

Traveling Wave Tube
CW Amplifier

4 W 8 0

The 4W80 is a CW traveling-wave amplifier for operation over the frequency range of 3.6 to 4.2 kmc. This tube type has an average small signal gain of 30 db and a saturated output power of 18 watts. The construction of the tube is of the conventional helical line type employing input and output waveguide couplings. These couplings have integral tapered waveguide adapters with adjusting screws for impedance matching. The 4W80 uses integral periodic permanent magnet focusing; it is convection cooled, and operates with a depressed collector electrode voltage. The latter feature produces a significant improvement in the operating efficiency. The design, construction, and long life expectancy of the tube make it exceptionally well suited for use in point-to-point, broadband, multi-channel microwave relay equipments.

FEATURES

- o Depressed Collector Operation For Improved Effciency
- o Convection Cooled
- o PPM Focused
- o Long Life

CHARACTERISTICS

ELECTRICAL

Maximum Ratings[1]

Accelerating Anode Voltage	3700 V
Accelerating Anode Current	1mA
Helix Voltage	3400 V
Helix Current[2]	1.5 mA
Collector Voltage, min.	2000 V
Collector Current[3]	45 mA
Collector Dissipation	90 W
Focusing Electrode Voltage	-75 V
Ambient Temperature	55°C
Ambient Temperature, min.	-55°C
Collector Seal Temperature	180°C

PHYSICAL

General

Dimensions	See Outline
Weight	11 lbs
Preferred Mounting Position[4]	Horizontal
Cathode	Oxide coated, unipotential
Connections	
RF Input and Output	Reduced height WR229

OPERATION

Heater Voltage = 6.3 V; Heater Current at 6.3 V = 0.74 A

Frequency	3.7	4.0	4.2	kMc
Accelerating Anode Voltage	3100	3100	3100	V
Helix Voltage	2900	2850	2770	V
Helix Current	0.6	0.6	0.6	mA
Collector Voltage	2000	2000	2000	V
Collector Current	45	45	45	mA
Focusing Electrode Voltage	-30	-30	-30	V
RF Output (10 mW input level)	11	13	12	W
RF Saturated Output	19	20	19	W
Noise Figure (small signal)	27	27	27	db
Small Signal Gain (0.5 mW input)	33	33	33	db

NOTES:

1. Ratings should not be exceeded under continuous or transient conditions. A single rating may be the limitation and simultaneous operation at an other rating may not be possible. Design values for systems should include a safety factor to maintain operation within ratings under volt age and environmental variations.

2. Helix current increases gradually with tube life. Impending end of tube, life is indicated when the helix current reaches 2.5 milliamperes.

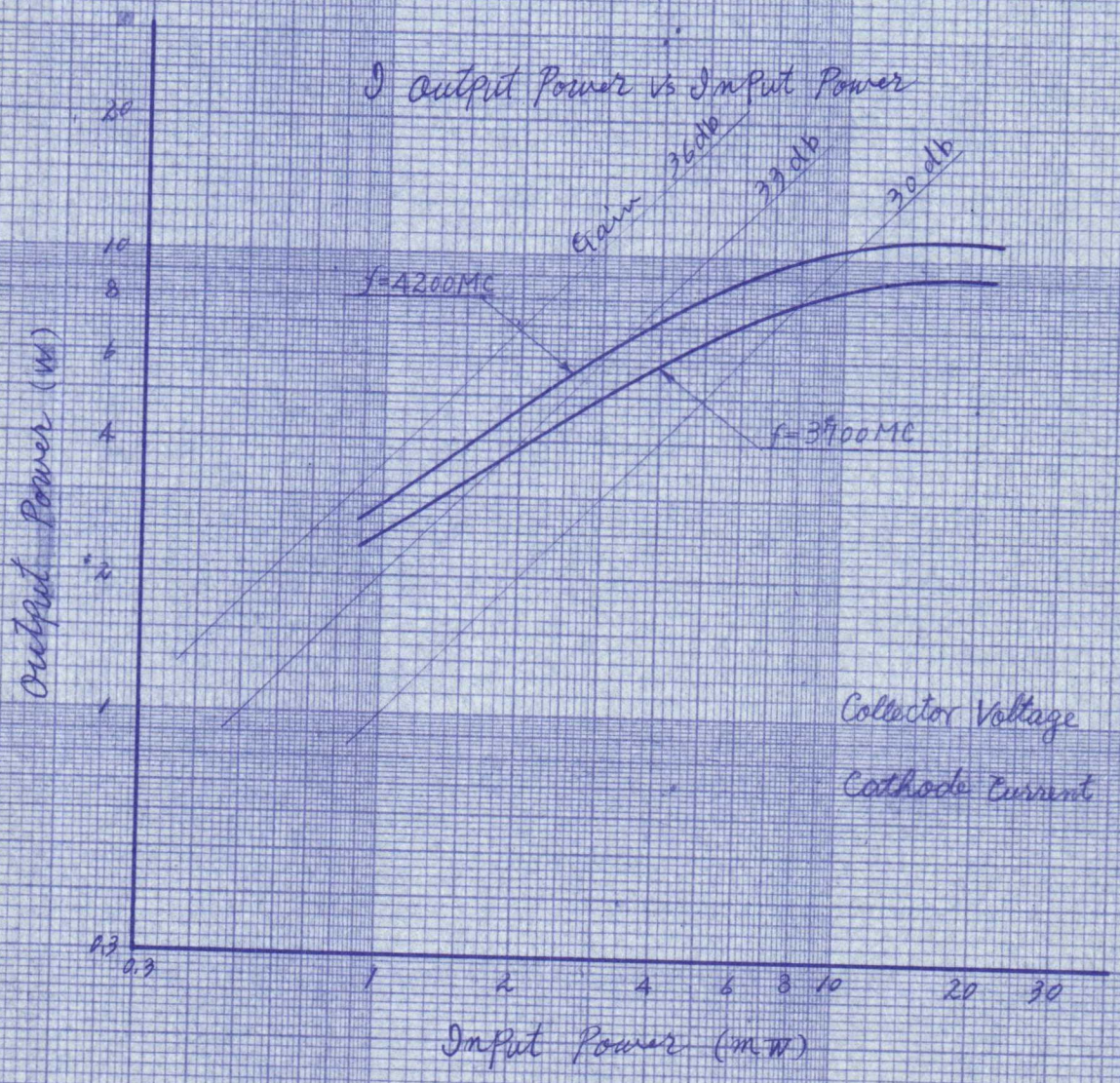
3. No rf drive power should be used during installation and voltages adjustments on the tube. Under these conditions brief excursions of the collector current up to 50 milliamperes will not damage the tube.

4. Convection cooling is sufficient when the tube is used in a horizontal position. For any other mounting position it may be necessary to direct some air flow through the cooling fins in order to keep the collector seal temperature at a safe operating level.

1W 40

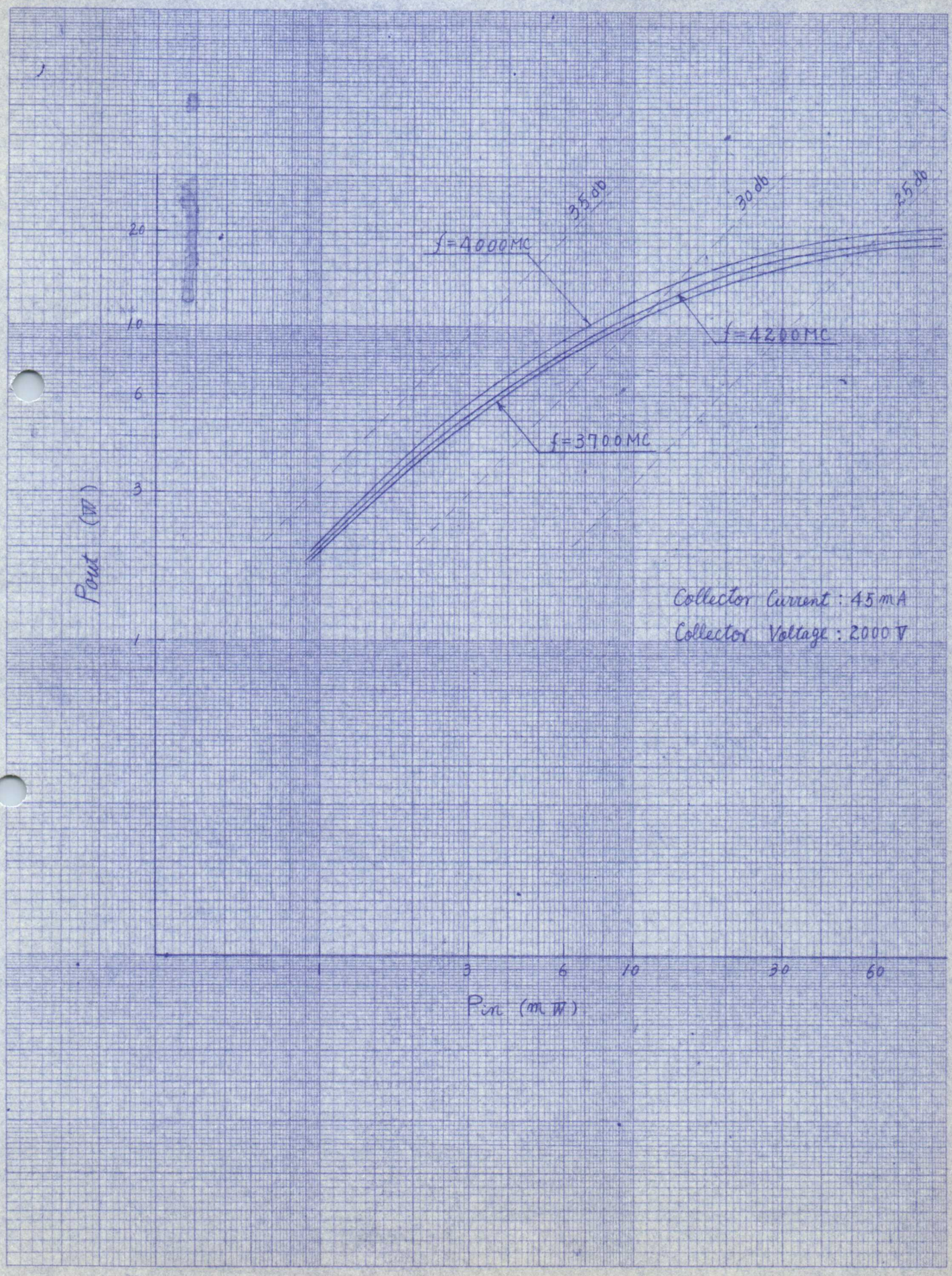
Characteristic curves

1 Output Power vs Input Power

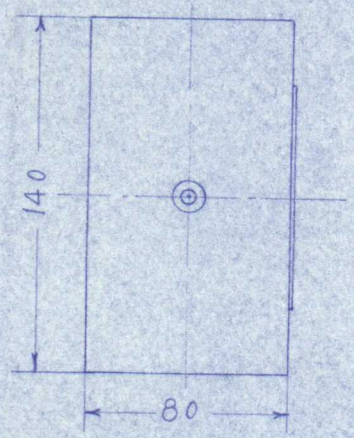


Collector Voltage 3500 V

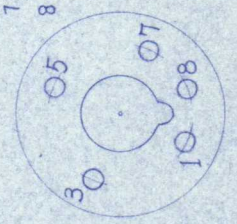
Cathode Current 40 mA

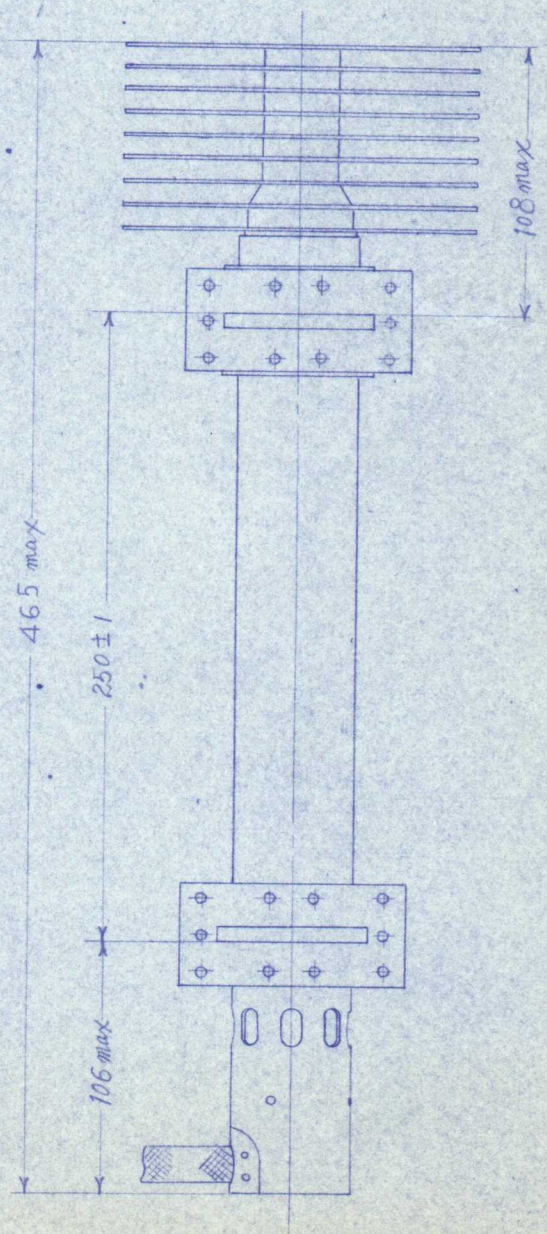

35db
30db
25db
f=4000MC
f=4200MC
f=3700MC
Collector Current : 45mA
Collector Voltage : 2000V
Pout (W)
20
10
6
3
1
Pin (mW)
1
3
6
10
30
60

NEC



1 Heater
3 1st Anode
5 Helix
7 Heater & Cathode
8 Focusing Electrode





4W85

SHF TRAVELING WAVE TUBE

The type 4W85 is a traveling wave tube designed for use with an electro-magnetic solenoid for CW operation over the 3,700 to 4,200 Mc range with an average gain of 24 db and a maximum power output of 200 milliwatts. It is a conventional helical line type tube employing waveguide input and output coupling.

GENERAL CHARACTERISTICS

Cathode	Oxide-coated, indirectly heated
Heater Voltage	6.3 Volts
Heater Current	1.5 Amperes.

MAXIMUM RATINGS

Focusing Electrode Voltage	−12 Volts
1 st Anode Voltage	1,000 Volts
Helix Voltage (2 nd Anode Voltage)	1,200 Volts
Collector Voltage	1,200 Volts
Cathode Current	5 Milliamperes
1 st Anode Current	0.3 Milliamperes
Helix Current (2 nd Anode Current)	2 Milliamperes
Collector Dissipation	6 Watts

TYPICAL OPERATING DATA

Frequency	4,000 Mc
Focusing Electrode Voltage	−3 Volts
1 st Anode Voltage	820 Volts
Helix Voltage (2 nd Anode Voltage)	1,130 Volts
Helix Current (2 nd Anode Current)	0.7 Milliamperes
Cathode Current	5 Milliamperes
R. F. Input	0.6 Milliwatts
R. F. Output	180 Milliwatts
Focusing Field	400 Gauss

OPERATIONAL SEQUENCE

When putting the 4W85 into operation, initial adjustments should be performed in the following sequence:

1. Apply the recommended focusing field.
2. Apply heater voltage and allow one minute minimum warm up.
3. Apply −5 volts to the focusing electrode; 1,200 volts maximum to the collector; 1,000 volts to the helix (2 nd anode); 500 volts to the 1 st anode in that order.
4. Adjust tube position relative to the focus coil so that collector current is maximum, and helix (2 nd anode) current is minimum. This current division can be optimized by adjusting the position of the magnetic shield surrounding the electron gun and focusing electrode voltage.
5. Slowly increase the 1 st anode voltage until the rated cathode current is reached.
6. Trim the focusing electrode voltage and tube position for proper current division.

MAGNETIC FIELD

Small variations of the magnetic field strength along the axis may be tolerated as long as the field distribution is symmetrical with respect to its axis. It is essential, however, that the axis of the tube and that of the magnetic field be coaxial, in any event.

WAVEGUIDES

Internal dimensions of the input and output coupling waveguide are as follows:

12 mm × 58 mm

The proper impedance matching of the tube and the guides will be obtained only if the terminations of the helix are correctly oriented relative to the guides.

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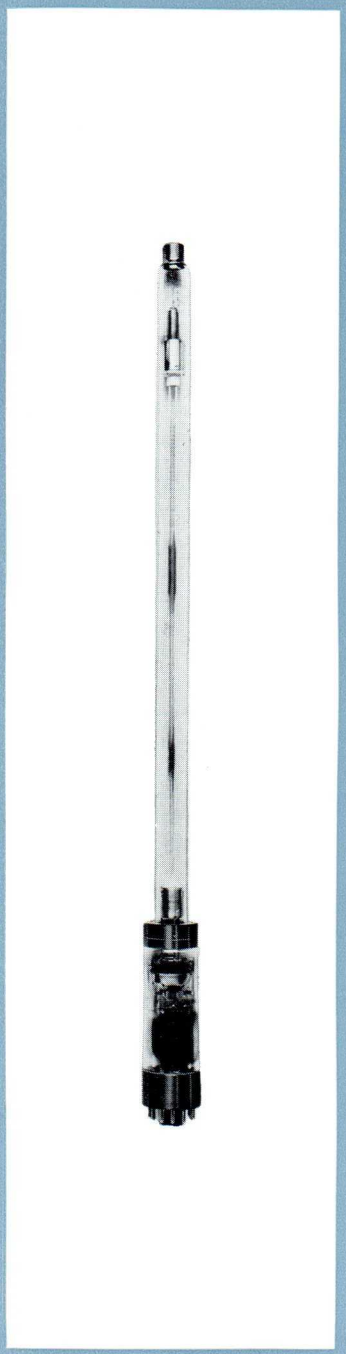
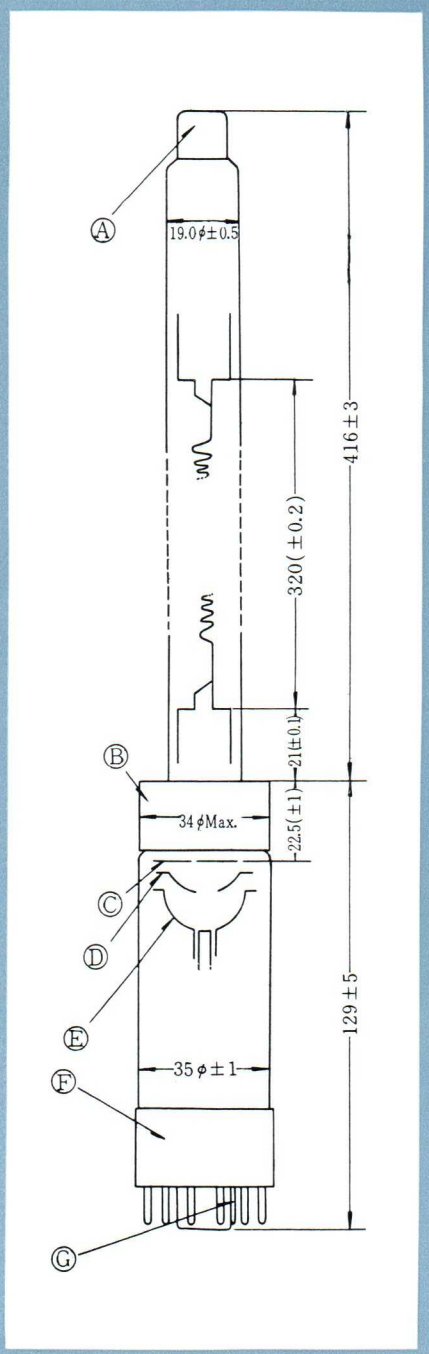
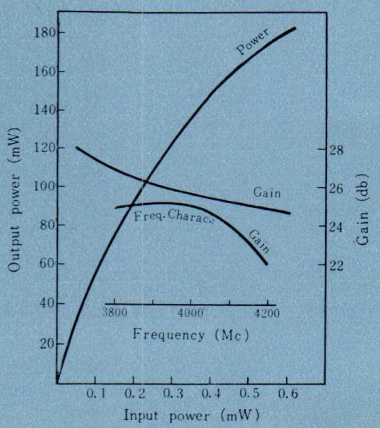
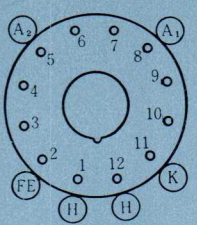




Characteristics





Ⓐ CES A 14 S Cap
Ⓑ Alignment Ring
Ⓒ 2nd Anode
Ⓓ 1 st Anode
Ⓔ Focusing Electrode
Ⓕ Duodecal Base
Ⓖ Base Key

NEC *Nippon Electric Company Ltd.*

2, Shiba Mita Shikoku-machi, Minato-ku, Tokyo, Japan
Tel. Tokyo 45-1171 (9) • 5121 (9) • 5221 (9)
Cable Address "MICROPHONE TOKYO"

Cat. No. 331173C-7

4W86A

NEC MICROWAVE TUBES

SHF TRAVELING WAVE TUBE

The type 4W86 A is a traveling wave tube designed for use with an electro-magnetic solenoid in CW operation over the 3,700 to 4,200 Mc range with an average gain of 12 db and a maximum power output of 1.5 Watts. It is a conventional helical line type tube employing waveguide input and output coupling. 4W86 A has better input and out- put voltage standing wave ratio than that of the type 4W86.

GENERAL CHARACTERISTICS

Cathode	Oxide-coated, indirectly heated
Heater Voltage	6.3 Volts
Heater Current	1.5 Amperes

MAXIMUM RATINGS

Focusing Electrode Voltage	–22 Volts
1 st Anode Voltage	2,000 Volts
Helix Voltage (2 nd Anode Voltage)	2,150 Volts
Collector Voltage	2,150 Volts
Cathode Current	15 Milliamperes
1 st Anode Current	0.5 Milliamperes
Helix Current (2 nd Anode Current)	1.6 Milliamperes
Collector Dissipation	35 Watts

TYPICAL OPERATING DATA

Frequency	4,000 Mc
Focusing Electrode Voltage	–10 Volts
1 st Anode Voltage	1,700 Volts
Helix Voltage (2 nd Anode Voltage)	0.4 Milliamperes
Helix Current (2 nd Anode Current)	2,030 Volts
Cathode Current	15 Milliamperes
R. F. Input	60 Milliwatts
R. F. Output	1,250 Milliwatts
Focusing Field	400 Gauss

COOLING

Forced-air Cooling	0. 05 m^3/min

OPERATIONAL SEQUENCE

When putting the 4W86A into operation, initial adjustments should be performed in the following sequence :

1. Apply the recommended focusing field.
2. Apply heater voltage and allow one minute minimum warm up.
3. Apply –10 volts to the focusing electrode ; 2,150 volts maximum to the collector; 2,000 volts to the helix (2 nd anode); 1,200 volts to the 1 st anode in that order.
4. Adjust tube position relative to the focus coil so that collector current is maximum, and helix (2 nd anode) current is minimum. This current division can be optimized by adjusting the position of the magnetic shield surrounding the electron gun and focusing electrode voltage.
5. Slowly increase the 1 st anode voltage to the the rated cathode current.
6. Trim the focusing electrode voltage and tube position for proper current division.

MAGNETIC FIELD

Small variations of the magnetic field strength along the axis may be tolerated as long as the field distribution is symmetrical with respect to its axis. It is essential, however, that the axis of the tube and that of the magnetic field be coaxial, in any event.

WAVEGUIDE

Internal dimensions of the input and output coupling waveguide are as follows :

12 mm × 58 mm

The proper impedance matching of the tube and the guides will be obtained only if the terminations of the helix are correctly oriented relative to the guides.

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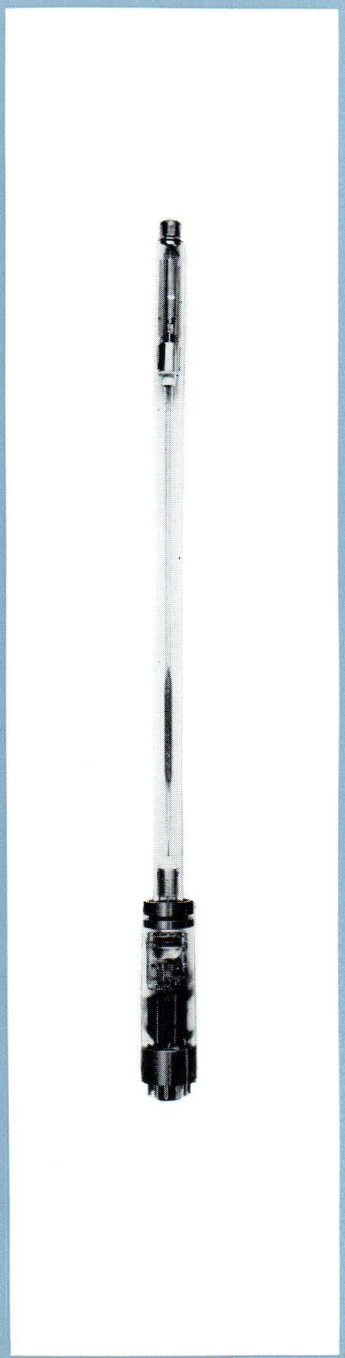
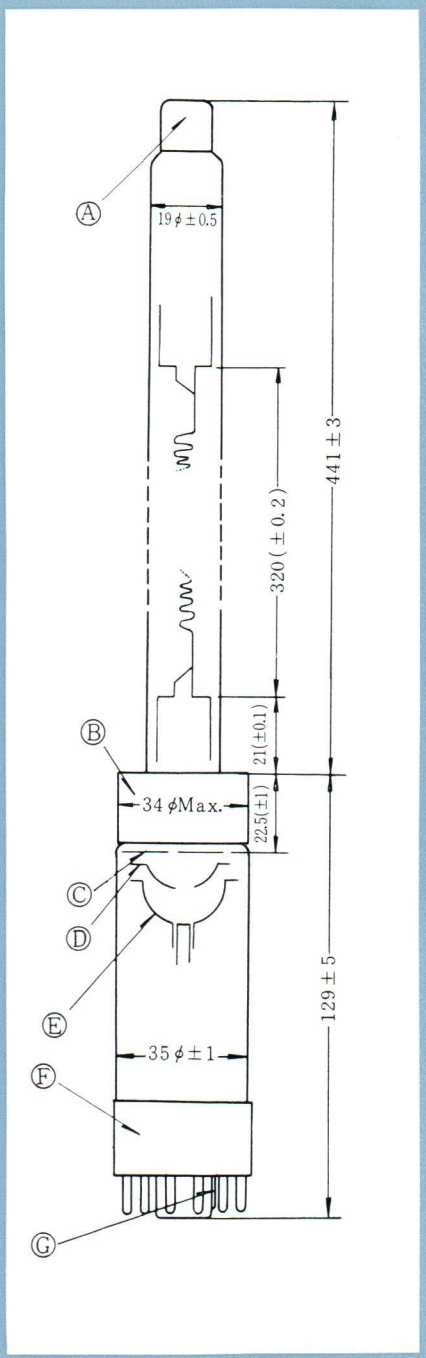
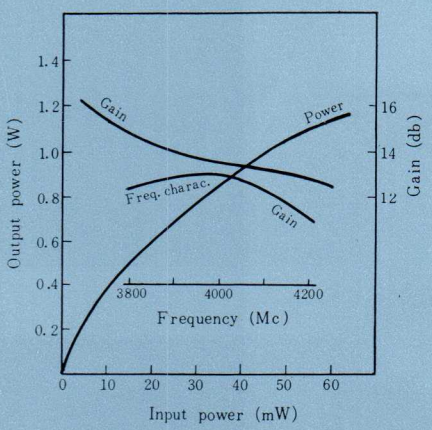
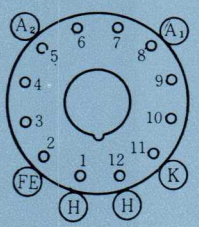




Characteristics





Ⓐ CES A 14 Cap
Ⓑ Alignment Ring
Ⓒ 2 nd Anode
Ⓓ 1 st Anode
Ⓔ Focusing Electrode
Ⓕ Duodecal Base
Ⓖ Base Key

NEC Nippon Electric Company Ltd.

2, Shiba Mita Shikoku-machi, Minato-ku, Tokyo, Japan
Tel. Tokyo 45-1171 (9) • 5121 (9) • 5221 (9)
Cable Address "MICROPHONE TOKYO"

Cat. No. 331173C-8

TRAVELING-WAVE TUBE 6W50

GENERAL

The 6W50 is a CW traveling-wave amplifier designed for operation in a frequency range of ~~5.85~~ to 6.45 kMc. This tube has an average small signal gain of 30 db and a saturated output power of 10 watts. The tube operates with depressed collector electrode voltage to provide significant improvement in operating efficiency. It is of coventional helical line construction with reduced height waveguide input and output couplings. Separate tapered waveguide adapters, with adjusting screws for impedance matching, are available to match standard WRJ-6 flanges. This tube employs integral periodic-permanent magnet focusing and forced air cooling. The design, construction, and durability of the tube make it exceptionally well suited for use in point-to-point, broad-band, multichannel microwave relay equipment.

FEATURES

• Depressed collector operation for improved efficiency • PPM focused • Durability

CHARACTERISTICS

Physical

Dimensions	See outline drawing
Weight	3.5 kg
Preferred mounting position	Any
Cathode	Oxide-coated, unipotential
(Minimum heating time ····· 90 sec)	
Cooling	Forced air 0.5 m^3/min
Connector	Reduced height WRJ-6

Electrical

MAXIMUM RATINGS*

Accelerating anode voltage	2800 v
Accelerating anode current	0.5 ma
Helix voltage	3600 v
Helix current**	2 ma
Collector voltage, min	~~280~~ v 2800
Collector current	32 ma
Collector dissipation	90 w
Focusing electrode voltage	−50 v
Ambient temperature	55° C
Ambient temperature, min	−55° C
Collector seal temperature	150° C

OPERATION (HEATER VOLTAGE = 6.3v HEATER CURRENT AT 6.3v = 1.2a)

Frequency	6.15 kMc
Accelerating anode voltage	2320 v
Helix voltage	3270 v
Helix current	0.1 ma
Collector voltage	2800 v
Collector current	30 ma
Focusing electrode voltage	−35 v
RF output (8-mw input level)	7.7 w
RF saturated output	11 w
Noise figure (small signal)	28 db
Small signal gain (0.5-mw input)	30 db

NOTES:

* Ratings should not be exceeded under continuous or transient conditions. A single rating may be the limitation and simultaneous operation at another rating may not be possible. Design values for systems should include a safety factor to maintain operation within ratings under voltage and environmental variations.

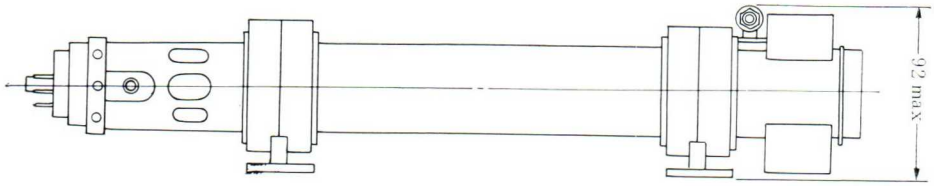
** Helix current increases gradually with tube life. Impending termination of tube life is indicated when the helix current reaches 2 milliamperes.

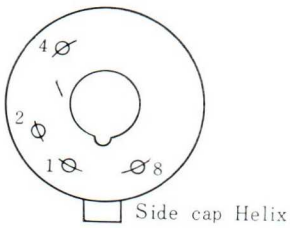
6W50

NEC

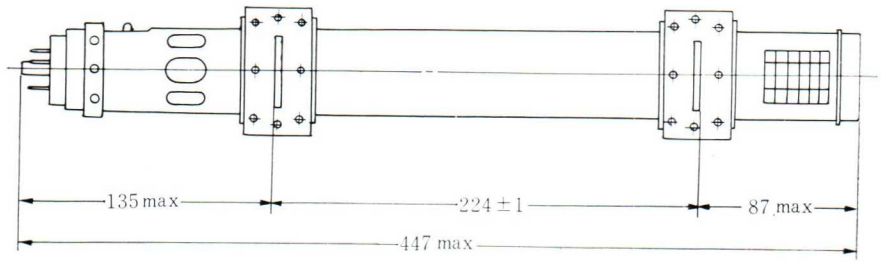
OUTLINE DRAWING

1. FOCUSING ELECTRODE
2. HEATER
4. ACCELERATING ANODE
8. HEATER-CATHODE

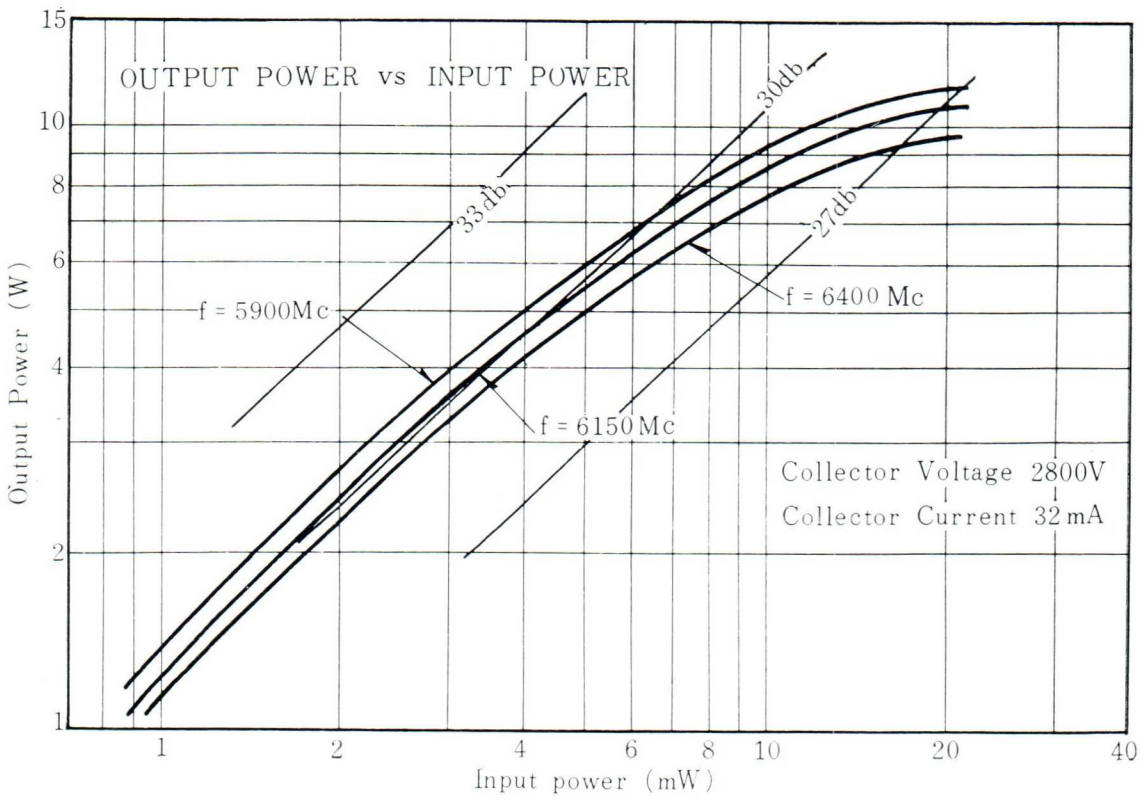




Side cap Helix



CHARACTERISTIC CURVES ALL CURVES ARE OF AVERAGE VALUES



NEC Nippon Electric Company Limited
P.O. Box 1, Takanawa, Tokyo, Japan
Cable Address: "MICROPHONE TOKYO"

Cat. No. 443-16-e
6208-1000-M
Printed in Japan

6W50

NEC MICROWAVE TUBES

SHF PACKAGE-TYPE TRAVELING WAVE TUBE
(TENTATIVE DATA)

The type 6W50 is a periodically focused traveling-wave amplifier with cotinuous power output of 10 watts and gain of 30 db over the frequency range of 5,850~6,450 megacycles. It is intended primarily to be used at new radio relay system of Nippon Telegraph and Telephone Public Corporation, which is new under construction.

The tube is made of glass envelope construction, employing helical wave propagating structure, and packaged in cylindrical cases together with input and output waveguides and permanent magnet focusing devices.

GENERAL CHARACTERISTICS

Cathode	Oxide-coated, Unipotential
Heater Voltage	6.3 Volts
Heater Current	1.2 Amperes

MAXIMUM RATINGS

Heater-Cathode Voltage	Internally connected
Accelerator Voltage	2,800 Volts
Accelerator Current	0.5 Milliamperes
Helix Voltage	3,600 Volts
Helix Current	2 Milliamperes
Collector Voltage	3,700 Volts
Collector Dissipation	130 Watts
Focusing Electrode Voltage	-20 Volts
Helix Voltage to Ground (Collector)	500 Volts (Note 1)
Collector Temperature	150°C
Ambient Temperature	50°C

MECHANICAL CHARACTERISTICS

Mounting position	Any (Note 2)
Weight	3.5 Kgs
Adequate cooling required	0.5 m^3/minutes

TYPICAL OPERATING DATA

Frequency	6,150 Mc
Accelerator Votage	2,100 Volts
Accelerator Current	0 Milliampere
Helix Voltage	3,300 Volts
Helix Current	0.4 Milliamperes
Collector Voltage	3,350 Volts
Collector Current	30 Milliamperes
Focusing Electrode Voltage	0 Volt
Power Output	5 Watts

PRECAUTIONS

1. Care should be taken to avoid shock damage to the tube and the input and output waveguides. For the installation of this tube, it is desirable to use flexible waveguide section to which the tube is connected.
2. The screws used to fix the tube elements should never be moved.
3. The required air flow must always be supplied before any high voltages are applied to the tube.
4. The first anode voltage should not be applied before the focusing electrode, helix and collector voltages reach the specified values.
5. The tube body is connected to the collector electrode internally, so it is recommended that the body be kept at ground potential.

OPERATIONAL SEQUENCE

1. Bolt the tube securely to the mating wave guide flanges. Do not distort the tube capsule on the mounting, to avoid damage of the glass envelope.
2. Apply heater voltage and allow 90 seconds minimum warm up.
3. Apply the specified voltage to the focusing electrode, collector and helix voltages in that order.
4. Increase the 1st anode voltage until the rated cathode current is reached.
5. Trim the helix voltage for optimum operation.

TUNING PROCEDURE

Two short plungers provided in the input and output waveguides are used to tune the tube roughly to the external circuits.

When fine adjustment of impedance matching at input and output circuits is required, it is recommended that matching devices be used.

Note 1. Collector is internally connected to waveguides.

2. Upon connecting waveguides to external circuits, any stress in the package should be avoided.

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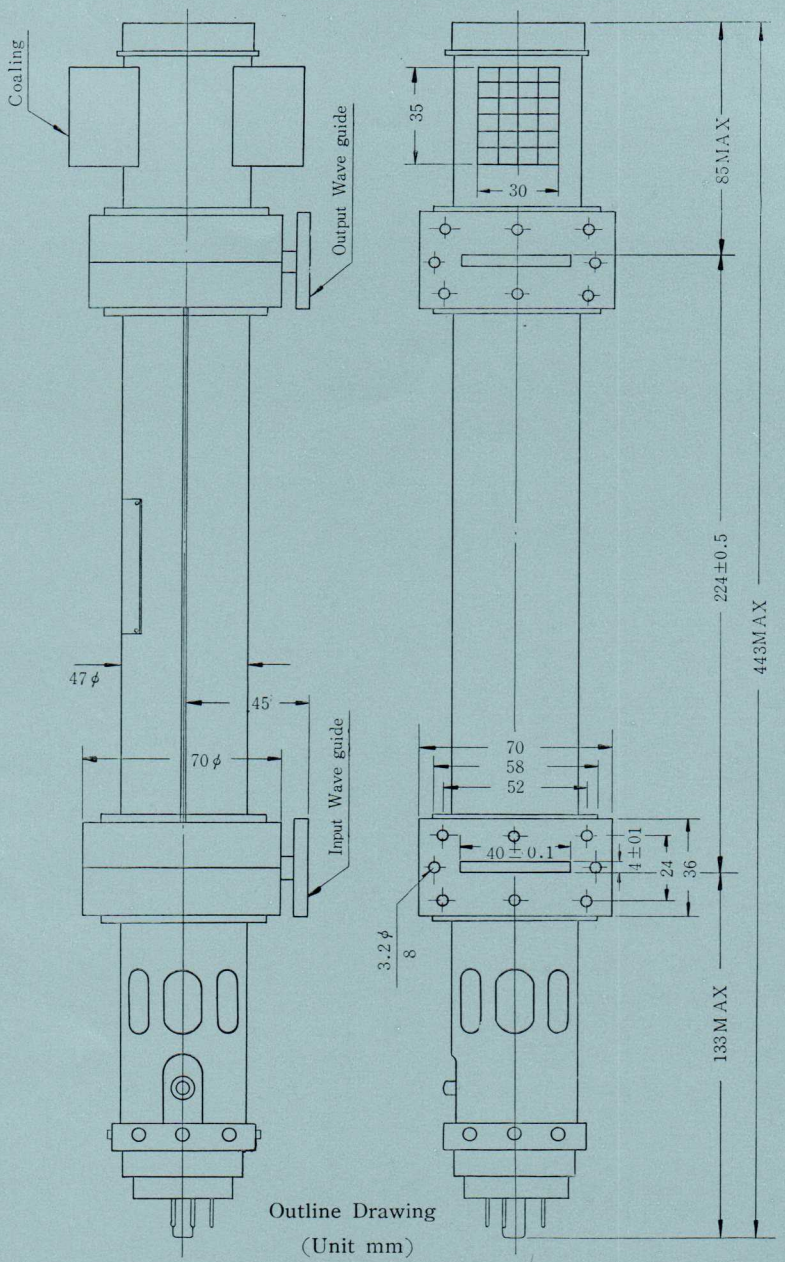
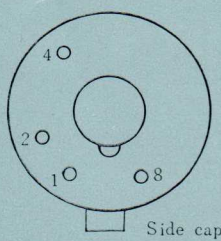
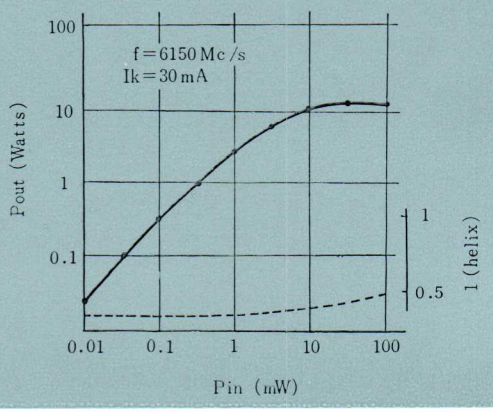


Outline Drawing
(Unit mm)



Side cap (Helix)

1. Control Electrode
2. Heater
4. Anode
8. Heater & Cathode



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Cat. No. 340673B-12

8W75

S H F PACKAGE-TYPE TRAVELING WAVE TUBE

The type 8W75 is a traveling wave amplifier and oscillator for CW operation over the 6,000 to 7,500 Mc range with an average small signal gain of 23 db and a maximum power output of around 2 Watts. It is a conventional helical line type tube employing wave guide input and output coupling. The focusing system of this tube consists of special magnetic lenses and periodic-magnetic field system which are packaged in cylindrical cases together with input and output waveguides and the tube itself.

GENERAL CHARACTERISTICS

Cathode	Oxide-coated, indirectly heated
Heater Voltage	6.3 Volts
Heater Current	1.0 Amperes

MAXIMUM RATINGS

Focusing Electrode Voltage	−70 Volts
1 st Anode Voltage	1,800 Volts
Helix Voltage (2 nd Anode Voltage)	3,300 Volts
Collector Voltage	3,350 Volts
Cathode Current	16 Milliamperes
1 st Anode Current	500 Microamperes
Helix Current (2 nd Anode Current)	2 Milliamperes
Collector Seal Temperature	150°C

MECHANICAL CHARACTERISTICS

Mounting position	Any
Volume of air required for cooling	0.12 m^3/min
Net weight	3 kgs.

TYPICAL OPERATING DATA

Frequency	6,400 Mc
Focusing Electrode Voltage	−50 Volts
1 st Anode Voltage	1,290 Volts
Helix Voltage (2 nd Anode Voltage)	3,200 Volts
Helix Current (2 nd Anode Current)	0.5 Milliamperes
Cathode Current	14 Milliamperes
Collector Voltage	3,250 Volts
R. F. Output (Saturated)	2.8 Watts
Small signal gain	30 db

PRECAUTIONS

1. Care should be taken to avoid shock damage to the tube and the input and output waveguides. For the installation of this tube, it is desirable to use flexible waveguides section to which the tube is connected.
2. The screws used to fix the tube elements should never be moved.
3. The required air flow must always be supplied before any high voltages are applied to the amplifier.
4. The first anode voltage should not be applied before the focusing electrode, helix and collector voltages reach the specified values,
5. The tube body is connected to the collector electrode internally, so it is recommended that the body be kept at ground potential.

OPERATIONAL SEQUENCE

1. Bolt the tube securely to the mating wave guide flanges. Do not distort the tube capsule on mounting, to avoid damage of the glass envelope.
2. Apply heater voltage and allow one minute minimum warm up.
3. Apply the specified voltages to the focusing electrode, collector and helix voltages in that order.
4. Increase the 1 st anode voltage until the rated cathode current is reached.
5. Trim the helix voltage for optimum operation.

TUNING PROCEDURE

Two short plungers provided in the input and output waveguides are used to tune the tube roughly to the external circuits.

When fine adjustment of impedance matching at input and output circuits is required, it is recommended that matching devices be used.

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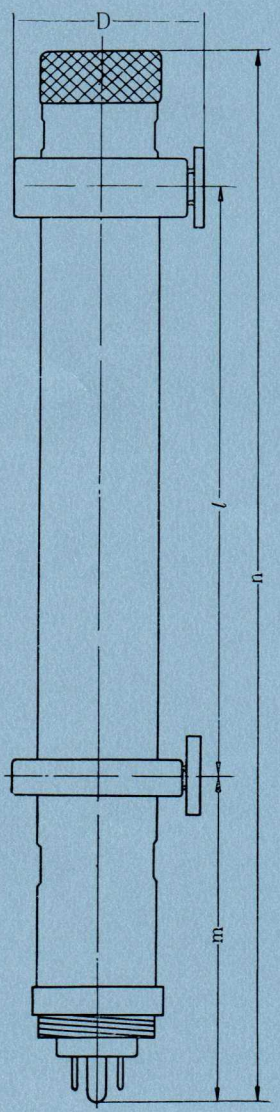
Unit mm



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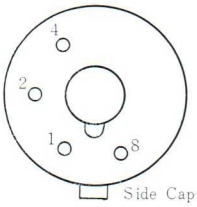
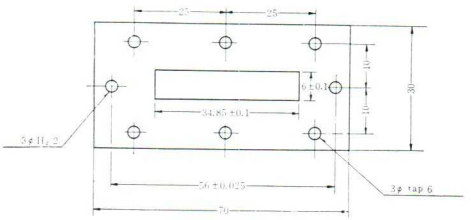
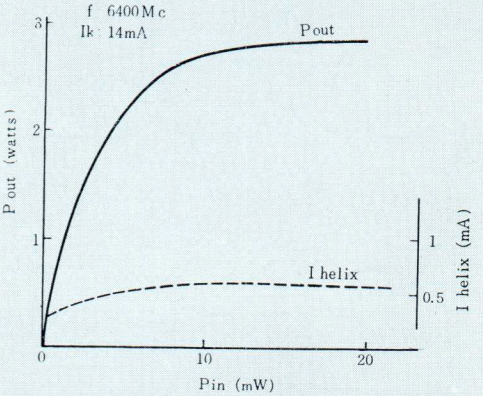
D = 80 max.
n = 453 max.



Side Cap (Helix)

1 Focusing Electrode
2 Heater
4 1 st anode
8 Heater & Cathode





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Cat. No. 331173C-9

8W76

NEC MICROWAVE TUBES

S H F PACKAGE-TYPE TRAVELING WAVE TUBE

The type 8W76 is a traveling wave amplifier and oscillator for C. W. operation over the 6,000 to 7,500 Mc range with an average small signal gain of 30 db and a maximum power output of around 5 watts. It is a conventional helical line type tube employing waveguide input and output coupling. The focusing system of this tube consists of a novel magnetic circuit and a conventional periodic magnetic field system which are packaged in cylindrical cases together with input and output waveguides and the tube itself, so the complete assembly is remarkably compact and light weight.

GENERAL CHARACTERISTICS

Cathode	Oxide-coated, indirectly heated
Heater Voltage	6.3 Volts
Heater Current	1.0 Amperes

MAXIMUM RATINGS

Focusing Electrode Voltage	−60 Volts
1 st Anode Voltage	3,000 Volts
Helix Voltage (2 nd Anode Voltage)	3,450 Volts
Collector Voltage	3,500 Volts
Cathode Current	28 Milliamperes
1 st Anode Current	1 Milliampere
Helix Current (2 nd Anode Current)	2 Milliamperes
Collector Seal Temperature	150°C

MECHANICAL CHARACTERISTICS

Mounting position	Any
Volume of air required for cooling	0.25 m^3/min
Net Weight	2.5 kgs.

TYPICAL OPERATING DATA

Frequency	7,500 Mc
Focusing Electrode Voltage	−40 Volts
1 st Anode Voltage	2,450 Volts
Helix Voltage (2 nd Anode Voltage)	3,000 Volts
Helix Current (2 nd Anode Current)	0.6 Milliamperes
Cathode Current	26 Milliamperes
Collecter Voltage	3,050 Volts
R. F. Output (at 5mW input level)	5 Watts

PRECAUTIONS

1. Care should be taken to avoid shock damage to the tube and the input and output waveguides. For the installation of this tube, it is desirable to use flexible waveguide section to which the tube is connected.
2. The screws used to fix the tube elements should never be moved.
3. The required air flow must always be supplied before any high voltages are applied to the tube.
4. The first anode voltage should not be applied before the focusing electrode, helix and collector voltages reach the specified values.
5. The tube body is connected to the collector electrode internally, so it is recommended that the body be kept at ground potential.

OPERATIONAL SEQUENCE

1. Bolt the tube securely to the mating wave guide flanges. Do not distort the tube capsule on the mounting, to avoid damage of the glass envelope.
2. Apply heater voltage and allow 90 seconds minimum warm up.
3. Apply the specified voltage to the focusing electrode, collector and helix voltages in that order.
4. Increase the 1 st anode voltage until the rated cathode current is reached.
5. Trim the helix voltage for optimum operation.

TUNING PROCEDURE

Two short plungers provided in the input and output waveguides are used to tune the tube roughly to the external circuits.

When fine adjustment of impedance matching at input and output circuits is required, it is recommended that matching devices be used.

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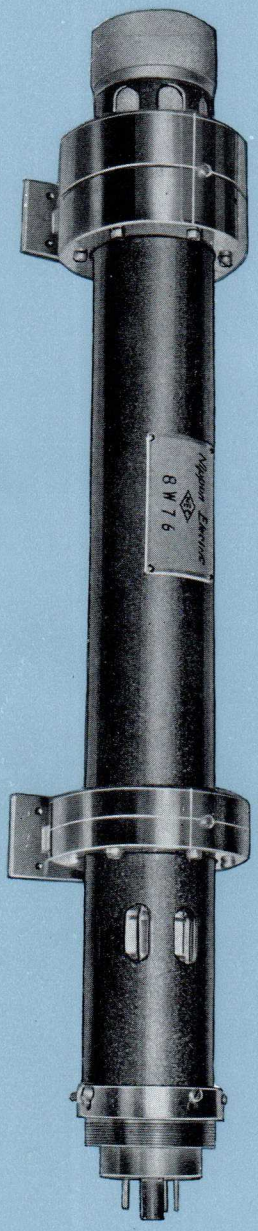
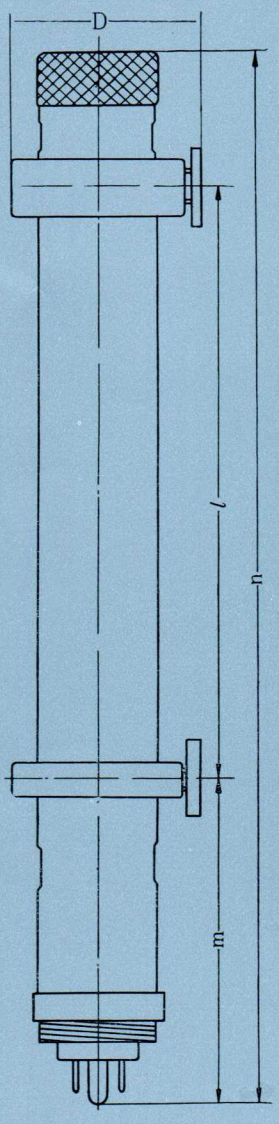
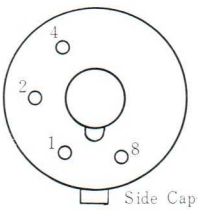


Unit mm

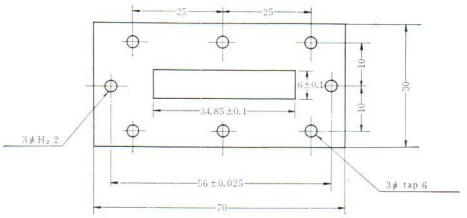


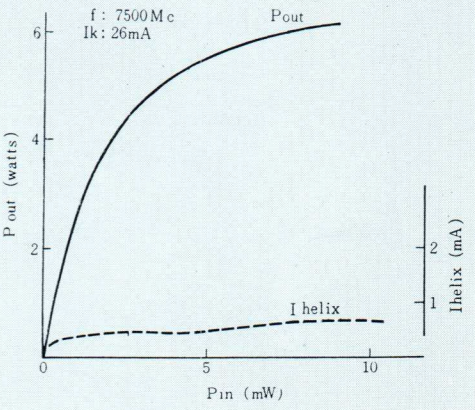
l =238.5±1
m=135 max.
D= 80 max.
n=450 max.



1 Focusing Electrode
2 Heater
4 1st Anode
8 Heater & Cothode

Side Cap (Helix)





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Cat. No. 331173C-10

11W17

SHF PACKAGE-TYPE TRAVELING WAVE TUBE

The type 11W17 is a traveling wave amplifier and oscillator in C. W. operation over the 10,700 to 11,700 Mc range with an average small signal gain of 30 db and a maximum power output of around 0.7 watts. It is a conventional helical line type tube employing waveguide input and output coupling. The focusing system of this tube consists of a novel magnetic circuit and a conventional periodic magnetic field system which are packaged in cylindrical cases together with input and output waveguides and the tube itself, so the complete assembly is remarkably compact and light-weight.

GENERAL CHARACTERISTICS

Cathode	Oxide-coated, indirectly heated
Heater Voltage	6.3 Volts
Heater Current	1.0 Ampere

MAXIMUM RATINGS

Focusing Electrode Voltage	−50 Volts
1 st Anode Voltage	1,400 Volts
Helix Voltage (2 nd Anode Voltage)	2,400 Volts
Collector Voltage	2,500 Volts
Cathode Current	8 Milliamperes
1 st Anode Current	0.5 Milliamperes
Helix Current (2 nd Anode Current)	1.5 Milliamperes
Collector seal Temperature	150°C

MECHANICAL CHARACTERISTICS

Mounting position	Any
Volume of air required for cooling	0.05 m^3/min
Net Weight	1.7 kgs.

TYPICAL OPERATING DATA

Frequency	11,200 Mc
Focusing Electrode Voltage	−20 Volts
1 st Anode Voltage	1,070 Volts
Helix Voltage (2 nd Anode Voltage)	2,110 Volts
Helix Current (2 nd Anode Current)	0.56 Milliamperes
Cathode Current	8 Milliamperes
Collector Voltage	2210 Volts
R.F. Output (at 4 mW input level)	0.95 Watts

PRECAUTIONS

1. Care should be taken to avoid shock damage to the tube and the input and output waveguides. For the installation of this tube, it is desirable to use flexible waveguide section to which the tube is connected.
2. The screws used to fix the tube elements should never be moved.
3. The required air flow must always be supplied before any high voltages are applied to the tube.
4. The first anode voltage should not be applied before the focusing electrode, helix and collector voltages reach the specified values.
5. The tube body is connected to the collector electrode internally, so it is recommended that the body be kept at ground potential.

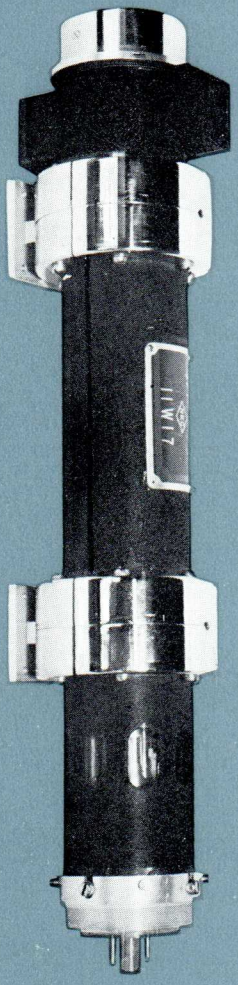
OPERATIONAL SEQUENCE

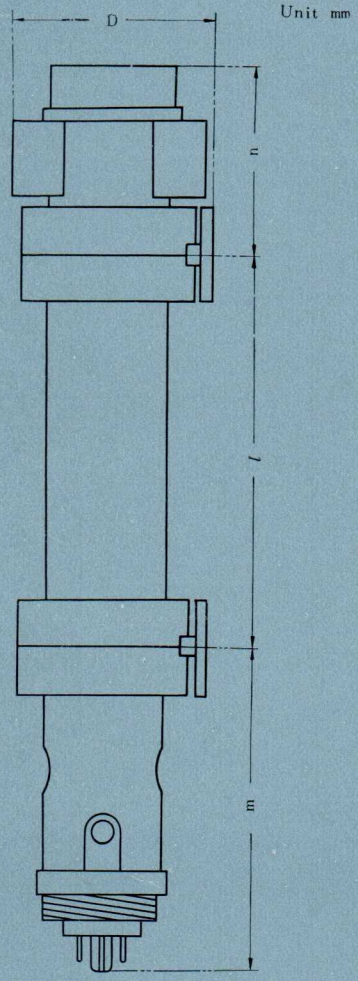
1. Bolt the tube securely to the mating waveguide flanges. Do not distort the tube capsule on mounting, to avoid damage of the glass envelope.
2. Apply heater voltage and allow 90 seconds minimum warm up.
3. Apply the specified voltages to the focusing electrode, collector and helix voltages in that order.
4. Increase the 1 st anode voltage until the rated cathode current is reached.
5. Trim the helix voltage for optimum operation.

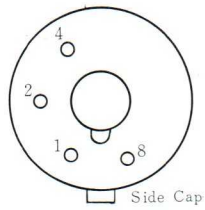
TUNING PROCEDURE

Two short plungers provided in the input and output waveguides are used to tune the tube roughly to the external circuits.

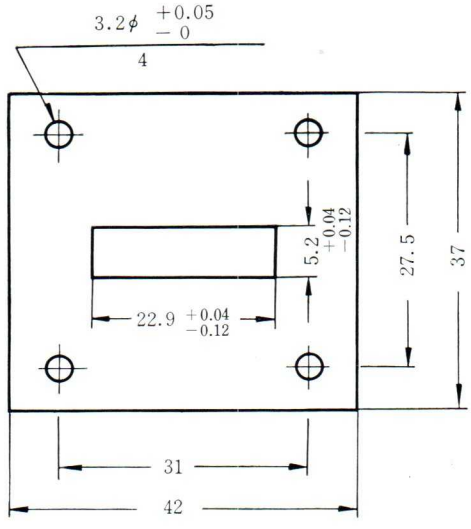
When fine adjustment of impedance matching at input and output circuits is required, it is recommended that matching devices be used.

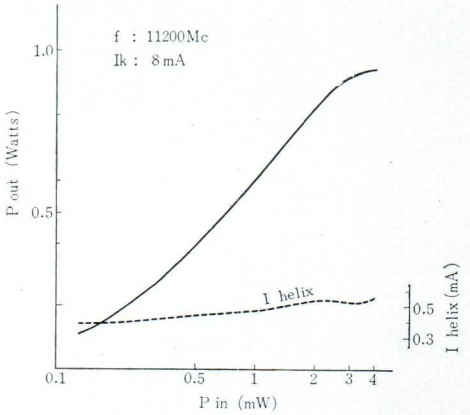






1 Focusing Electrode
2 Heater
4 1 st Anode
8 Heater & Cathode





l=148.8±1
m=136.6 max.
D=75 max.
n=77.6 max.
(mm)

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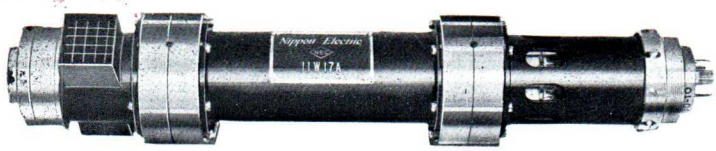
TRAVELING-WAVE TUBE 11W17A

GENERAL



The 11W17A is a CW traveling-wave amplifier designed for operation in a frequency range of 10.7 to 11.7 kMc. This tube has an average small signal gain of 30 db and a saturated output power of 1 watt. It is of conventional helical line construction with reduced height waveguide input and output coupling. Separate tapered waveguide adapters, with adjusting screws for impedance matching, are available to match standard WR90 flanges. This tube employs integral periodic-permanent focusing and forced air cooling. The design, construction, and durability of the tube make it exceptionally well suited for use in point-to-point, multichannel microwave relay equipment.

FEATURES

- PPM focused
- Durability

CHARACTERISTIC

Physical

Dimensions	See outline drawing
Weight	1.7 kg
Preferred mounting position	Any
Cathode	Oxide-coated, unipotential
(Minimum heating time 90 sec)	
Cooling	Forced air 0.05 m^3/min
Connector	Reduced height WR 90 (WRJ-10)

Electrical

MAXIMUM RATINGS*

Accelerating anode voltage	1400 v
Accelerating anode current	0.5 ma
Helix voltage	2400 v
Helix current**	0.7 ma
Collector voltage,	2500 v
Cathode current	8 ma
Collector dissipation	18 w
Focusing electrode voltage	−50 v
Ambient temperature	55° C
Ambient temperature, min	−55° C
Collector seal temperature	150° C

OPERATION (HEATER VOLTAGE=6.3v HEATER CURRENT AT 6.3v=1.0a)

Frequency	11.7 kMc
Accelerating anode voltage	1120 v
Helix voltage	2121 v
Helix current	0.25 ma
Collector voltage	2220 v
Collector current	7 ma
Focusing electrode voltage	−15 v
RF output (10-mw input level)	120 mw
RF saturated output	1.17 w
Noise figure (small signal)	28 db
Small signal gain (0.1-mw input)	30 db

NOTES:

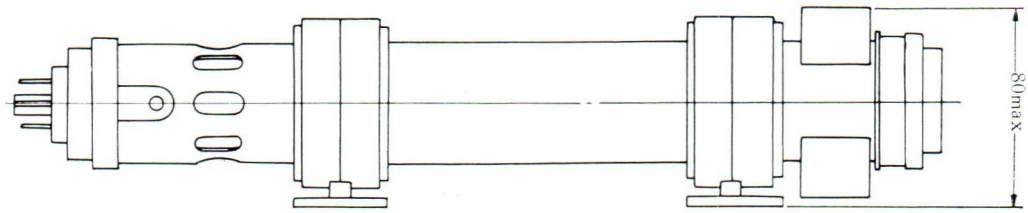
* Ratings should not be exceeded under continuous or transient conditions. A single rating may be the limitation and simultaneous operation at another rating may not be possible. Design values for systems should include a safety factor to maintain operation within rating under voltage and environmental variations.

** Helix current increases gradually with tube life. Impending termination of tube life is indicated when the helix current reaches 2 milliamperes.

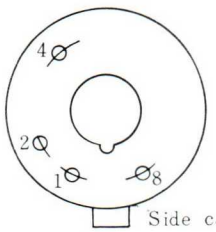
11W17A

NEC

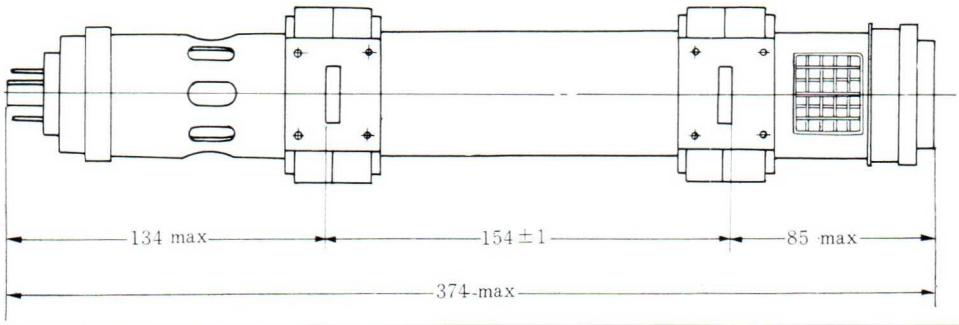
OUTLINE DRAWING



1. FOCUSING ELECTRODE
2. HEATER
4. ACCELERATING ANODE
8. HEATER-CATHODE

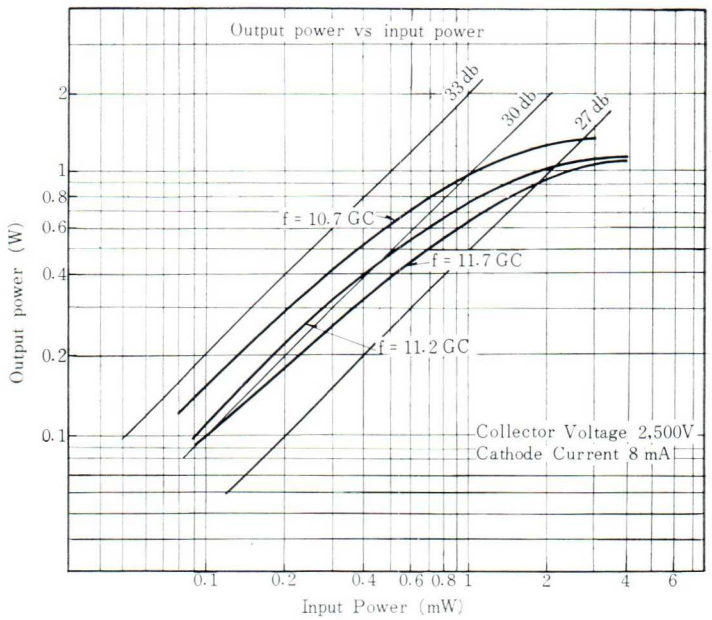


Side cap: Helix



CHARACTERISTICS CURVES

ALL CURVES ARE OF AVERAGE VALUES



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P.O. Box 1, Takanawa, Tokyo, Japan
Cable Address: "MICROPHONE TOKYO"

Cat. No. 443-17-E
6208-1000-M
Printed in Japan

5721 REFLEX KLYSTRON

The type 5721 is a broadband reflex klystron designed primarily for use in signal generators, spectrum analyzers, or local oscillators where broadband frequency coverage is required.

This tube operates over the frequency range from 2,500 to 11,000 Mc in conjunction with external cavities.

STRUCTURAL FEATURES

Disk sealed external cavity type; gold plated to keep the tube surface clean and make a good contact with an external cavity.

GENERAL CHARACTERISTICS

Frequency range ..... 2,500 to 11,000 Mc
Cathode ..... Oxide coated, indirectly heated
Heater Voltage ..... 6.3 Volts
Heater Current ..... 0.58 Amperes

MECHANICAL FEATURES

Resonant Cavity ..... external
Envelope ..... Glass & metal
Base ..... Special small 4-pin
Weight ..... 30 g

MAXIMUM RATINGS

Resonator Voltage ..... 1,250 Volts
Resonator Current ..... 20 milliamperes
#1 Grid Voltage ..... 25 Volts
#1 Grid Current ..... 6 milliamperes
#3 Grid Sleave Temperature ..... 160°C
Reflector Voltage ..... −15 to −800 Volts
Heater Voltage ..... 5.8 to 6.8 Volts
Heater to Cathode Voltage ..... ±45 Volts

TYPICAL OPERATION DATA

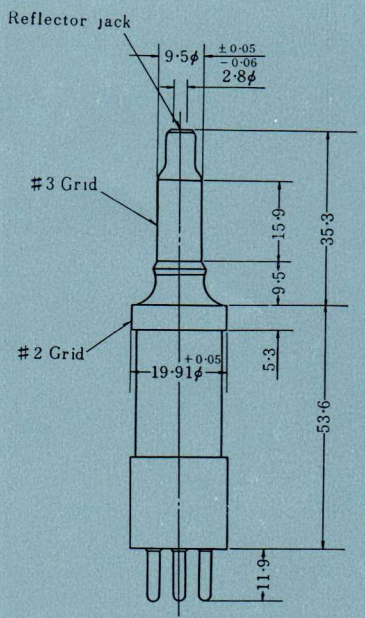
Frequency	4,200	7,500	10,800	Mc
Reflector Mode	2¾	2¾	3¾	
Cavity Mode	¾	¾	¾	
Resonator Voltage	1,000	1,000	1,250	Volts
Resonator Current (Adjusted by grid voltage)	20	20*	20	Milliamperes
Reflector Voltage	−90	−480	−290	Volts
Grid Voltage	14	11	12	Volts
Grid Current	3.0	2.5	2.5	Milliamperes
Power Output	125	160	40	Milliamperes

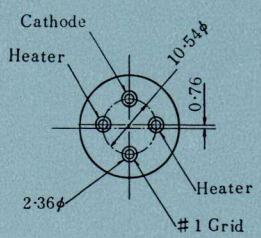
* Cathode current

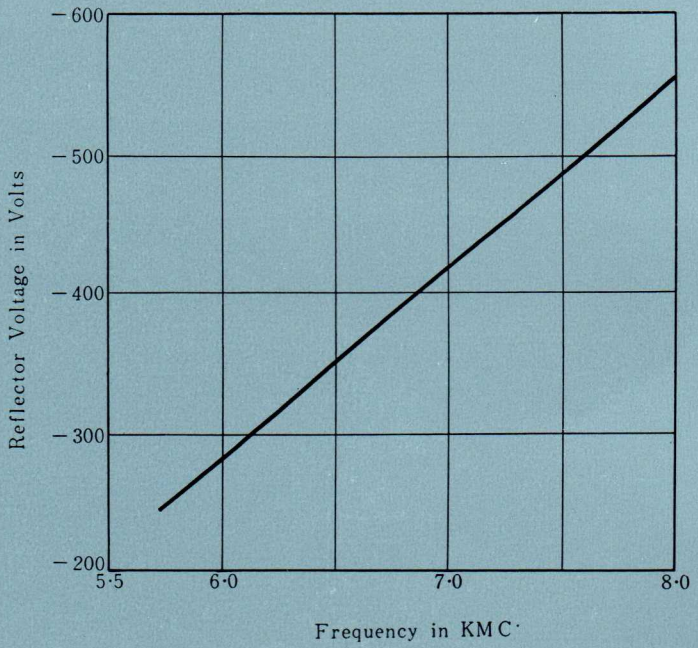
NOTICE :

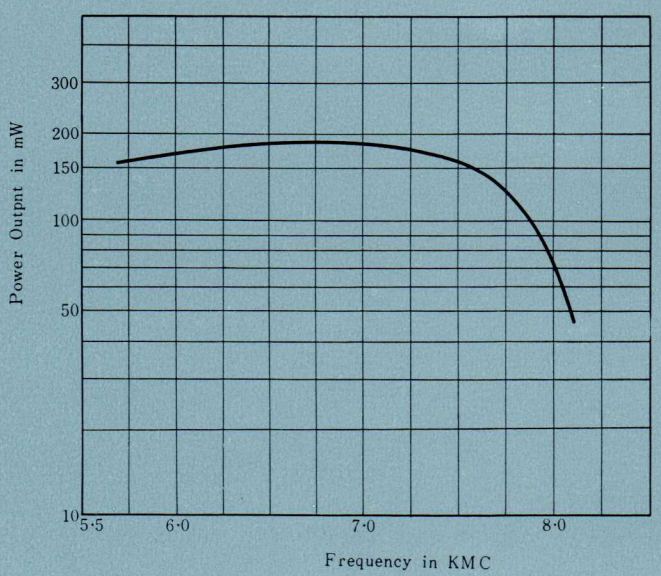
1. The heater voltage must be applied one minute before resonator voltage is applied.
2. The reflector voltage must be applied before resonator voltage.
3. The reflector must never become positive with respect to the cathode.
4. All contacting external parts should be silver plated or, if this is impossible, should be kept clean.
5. #3 grid sleave must be kept below 160°C.
6. When inserting the tube into the cavity, use very light twisting motion while pushing in.

Be sure never to apply bending force onto the tube.









Note: These characteristics are obtained in conjunction with a cavity designed for use over the frequency range from 6,000 to 7,500 megacycles. When other frequency ranges are required, suitable cavities must be designed.

NEC Nippon Electric Company Ltd.

2, Shiba Mita Shikoku-machi, Minato-ku, Tokyo, Japan
Tel. Tokyo 45-1171 (9) • 5121 (9) • 5221 (9)
Cable Address "MICROPHONE TOKYO"

DISC-SEALED PLANAR TRIODE 5861

GENERAL

The 5861 is a disc-sealed planar triode designed for use as an oscillator, or frequency multiplier in radio transmitters operating at frequencies up to 3700 Mc. It features low lead inductance and capacitance, ensuring good UHF performance.

The cathode consists of an indirectly-heated oxide coated disc. The anode dissipation is 10 watts with air cooling.

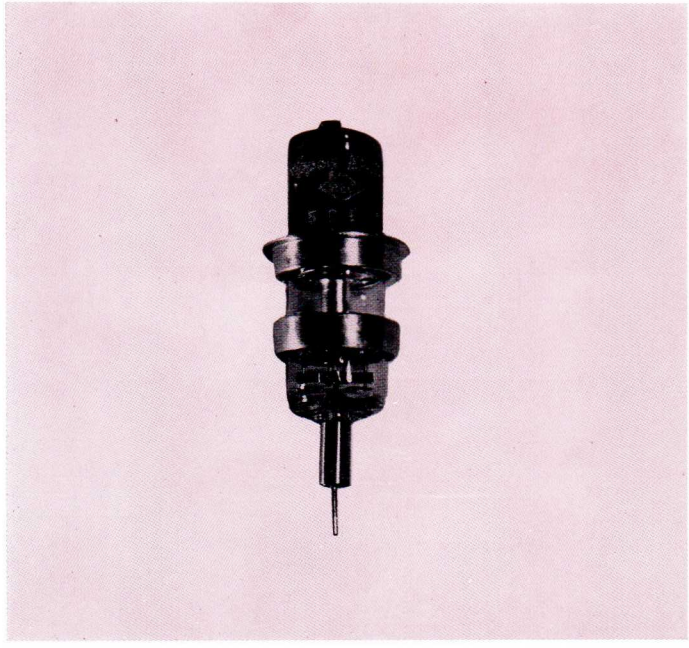
GENERAL CHARACTERISTICS

Electrical

Heater voltage..... 6.3 volts
Heater current.....0.4 amps
Transconductance(I_b 20 ma, E_b 250 v).....6 millimhos
Amplification factor.....30
Interelectrode capacitances
- Grid-plate..... 1.0 $\mu\mu$f
- Grid-cathode..... 2.0 $\mu\mu$f
- Plate-cathode.....0.03 $\mu\mu$f (max)

Mechanical

Mounting position.....Any
Type of cooling.....Convection
Net weight.....10 g



Nippon Electric Company Limited

DISC-SEALED PLANAR TRIODE 5861

NEC

MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS

RF POWER AMPLIFIER AND OSCILLATOR

Maximum Ratings

DC plate voltage	350 volts
DC plate current	40 ma
Peak plate current	150 ma
Plate dissipation*	10 watts
Frequency	3700 Mc
Seal temperature	140°C

Operating Data

RF oscillator, 300 Mc

DC plate voltage	250 volts
DC grid voltage	-8.5 volts
DC plate current	40 ma
DC grid current	1 ma
Useful power output	1 watt

Tolerance Ranges in Equipment Design

	Min.	Max.
Filament current at 6.3 volts	0.30	0.45 amps
Cut-off bias**	—	-15 volts
Grid-plate capacitance***	0.7	1.4 μμf
Grid-cathode capacitance***	1.5	2.5 μμf

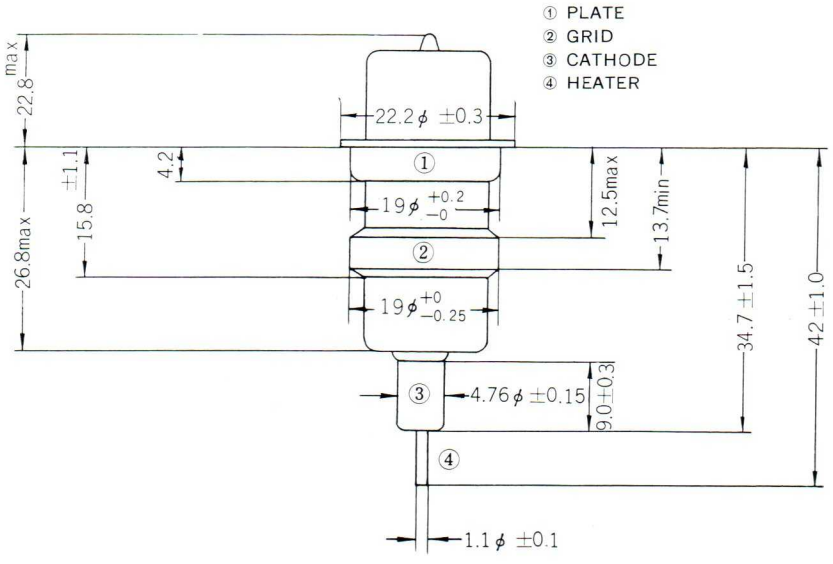
Mounting

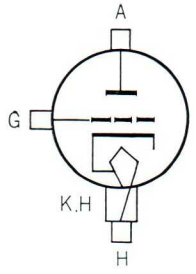
In mounting the tube, care must be taken to secure good electrical contacts. For this reason, it is strongly recommended that the anode, grid, cathode, and heater terminals of the tube should ride against spring collets or fingers.

Details of the terminal contacting surface are included in the outline drawing.

* To limit seal temperature and temperature rate of change at the anode seal, it is necessary that the mass of metal in close thermal contact with the anode disc be not less than 60 grams of brass or its equivalent.
** Measured at 1-ma plate current and a plate voltage of 250 volts
*** Capacitance measured with no voltage applied to the tube

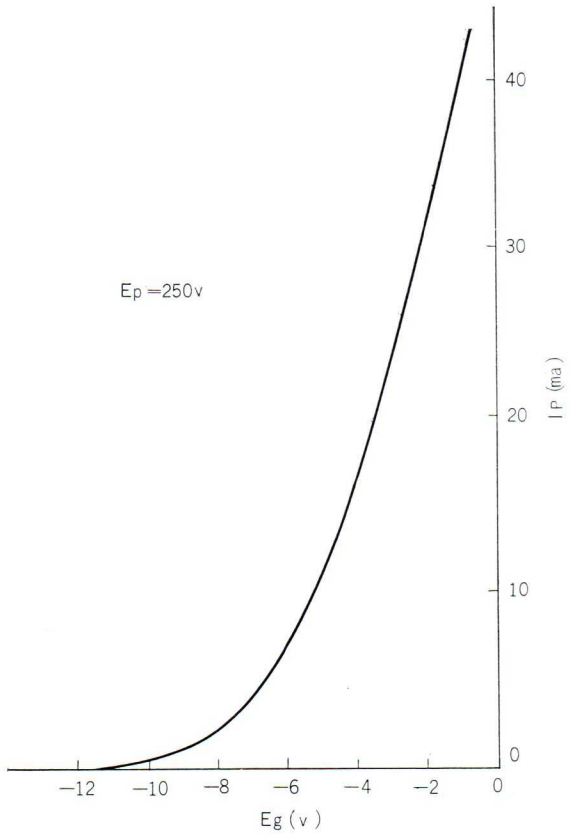
DIMENSIONS (mm)



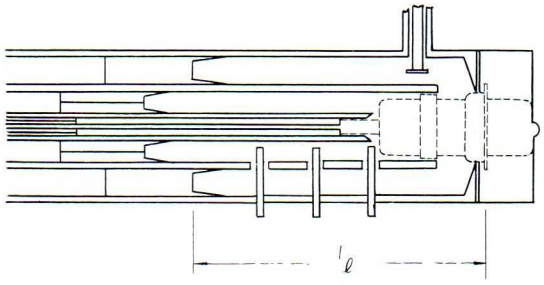


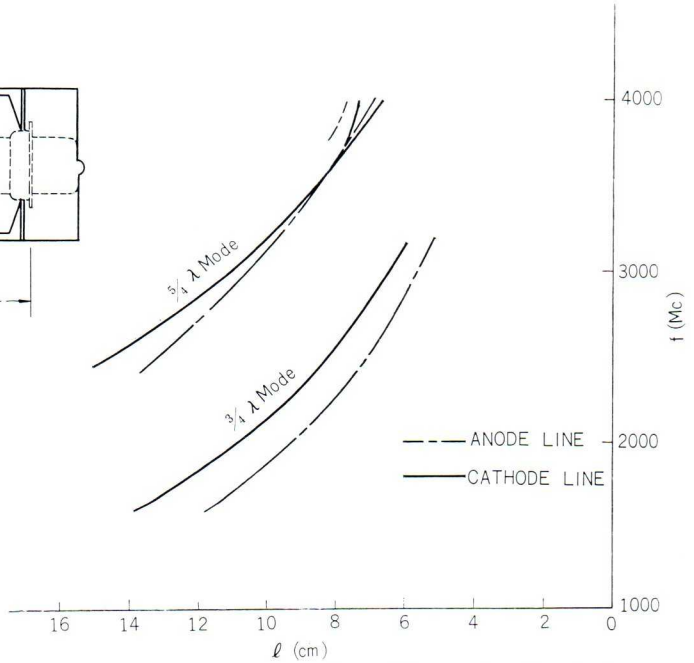
NEC

STATIC TRANSFER CHARACTERISTICS



TUNING CIRCUITS AND CHARACTERISTICS

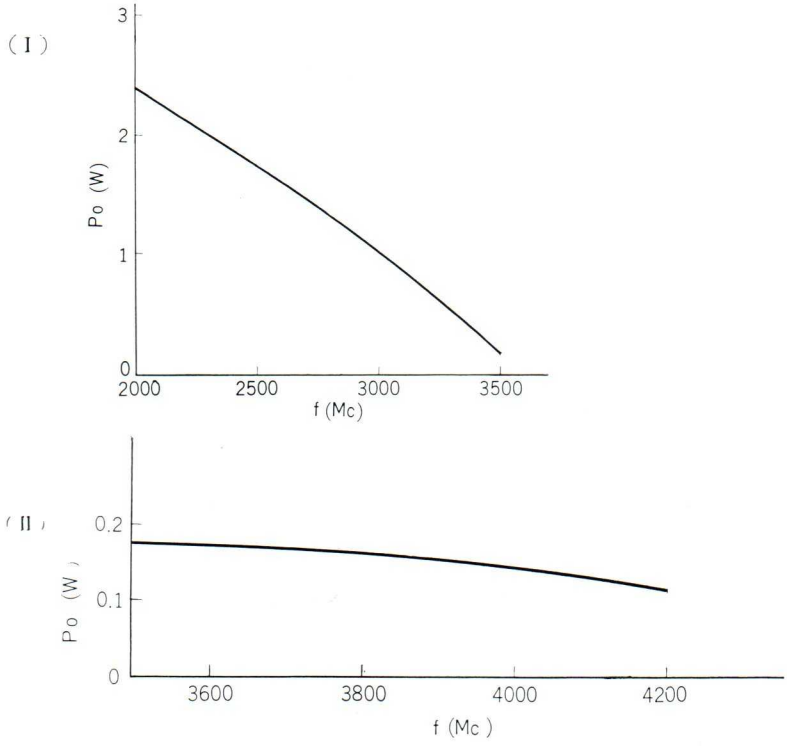




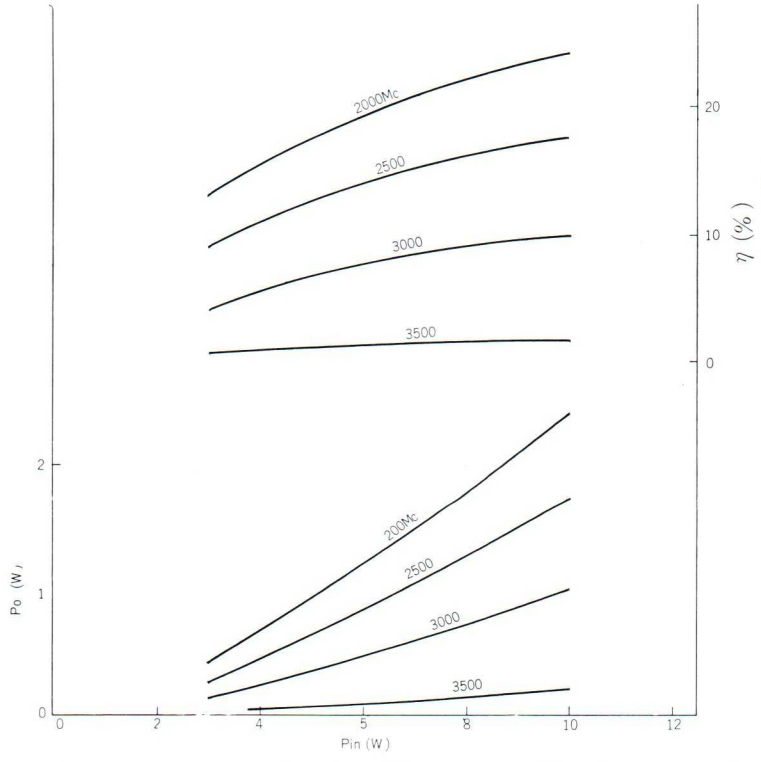
DISC-SEALED PLANAR TRIODE 5861

NEC

POWER OUTPUT vs. FREQUENCY



POWER OUTPUT AND EFFICIENCY vs. DC PLATE INPUT POWER



NEC Nippon Electric Company Limited
P.O. Box 1, Takanawa, Tokyo, Japan
Cable Address: "MICROPHONE TOKYO"

Cat. No. 445-2-E
6208-1000-M
Printed in Japan

ELECTRON TUBE LD-497

GENERAL

The LD-497 is a high-mu planar triode designed for use as an oscillator, power amplifier, or frequency multiplier in radio transmitting service at frequencies up to 2500 Mc. Features include low lead inductance and capacitance, high transconductance, and high plate dissipation. The cathode is an indirectly heated oxide-coated disc. The anode is cooled by forced air and is capable of dissipating 130 watts. Outline dimensions of the LD-497 are the same as the 2C39A or the 2C39B.

GENERAL CHARACTERISTICS

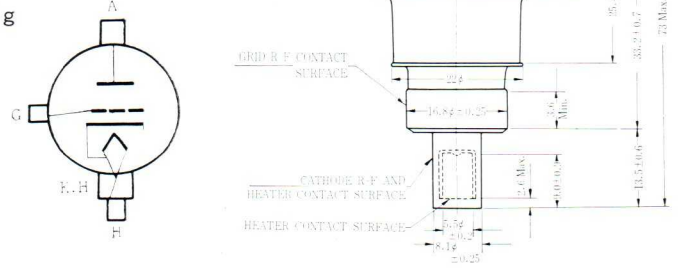
Electrical

Heater voltage (see application)	6.3 v
Heater current	1.3 a
Transconductance (I_b=120 ma, E_b=600 v)	36 millimhos
Amplification factor	90
Interelectrode capacitances	
Grid plate	2.1 $\mu\mu$f
Grid cathode	9.5 $\mu\mu$f
Plate cathode	0.08 $\mu\mu$f max

Mechanical

Mounting position	Any
Type of cooling	Forced air
Required air flow on anode	0.4 m^3/min
Maximum seal temperature	150°C
Net weight	90 g

OUTLINE DRAWING



MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS

RF POWER AMPLIFIER AND OSCILLATOR

Maximum Ratings

DC plate voltage	1000 v
DC grid voltage	−150 v
DC cathode current	200 ma
DC grid current	60 ma
Peak positive RF grid voltage	30 v
Peak negative RF grid voltage	−400 v
Plate dissipation (forced-air cooling)	130 w
Grid dissipation	3 w
Frequency	2500 Mc

Typical Operating Data

RF oscillator, 2500 Mc

DC plate voltage	900 v
DC grid voltage	−20 v
DC plate current	140 ma
DC grid current	35 ma
Useful power output	26 w

Class C Amplifier in Grounded-Grid Circuit at 1800 Mc

DC plate voltage	880 v
DC grid voltage	−22 v
DC plate current	140 ma
DC grid current (approx.)	10 ma
Driver power output (approx.)	4 w
Useful power output (approx.)	25 w

Characteristic Range Values for Equipment Design

	Min	Max
Filament current at 6.3 v	1.25	1.4 v
Cut-off bias*	–	−15 v
Grid plate capacitance**	~~1.8~~ 2.0	~~2.2~~ 2.4 μμf
Grid cathode capacitance**	~~7~~ 8	12 μμf

* Measured at 1 ma of plate current and a plate voltage of 600 volts

** Capacitance measured during cold state of the tube

APPLICATION

Mechanical

Mounting

When mounting the tube, care must be taken to secure a good electrical contact. For this reason it is strongly recommended that anode, grid, cathode, and heater terminals of the tube should ride against spring collets or spring fingers.
Details of the contacting surface of the terminals are shown in the outline drawing.
The tube, when in the socket, should be seated against the anode flange.

Cooling

Temperature of plate, grid, and cathode seals should not exceed 150°C under any operating conditions. Tube life and reliability will be enhanced when all seals are properly cooled under all operating conditions. An air flow through cowling, of 0.4-cubic meters per minute is recommended for the anode radiator when operating up to the rated maximum dissipation.

Electrical

Heater Voltage

Back-heating of the cathode will occur if operated above 400 Mc and merits consideration. Back-heating depends upon frequency, grid current, grid bias, circuit design and adjustment.
However, the following table can be safely used as a rule under normal conditions to offset the back-heating effects :

Operating Frequency	Heater Voltage, Ef
Below 400 Mc	6.3 v
400 to 1000 Mc	6.0 v
1000 to 1500 Mc	5.5 v
1500 to 2000 Mc	5.0 v
Above 2000 Mc	4.5 v

Tolerance of plus or minus 5 % may be allowed for the above recommended heater voltage values.

Circuit Tuning

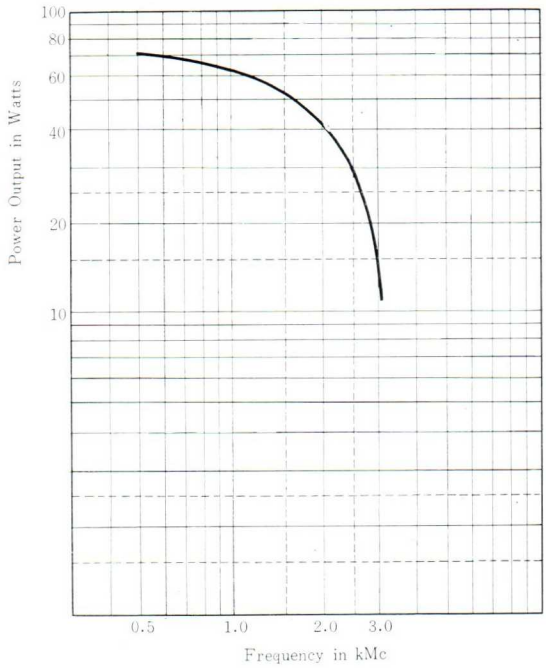
With high-frequency circuits, a very small motion of the tuning plunger may throw the tube out of resonance and result in high plate current and/or excessive anode dissipation. In practical useage it is recommended that provisions be made for tuneup at a reduced plate voltage.

Driving Power

In normal use a part of the total power supplied by the driving source will appear as grid dissipation ; the remainder is mainly absorbed by circuit losses.
For optimum tube life, the plate circuit should be heavily-loaded and the driving power should be reduced to the lowest value consistent with reasonable efficiency.
In general, low voltage, high current operation is preferable to high voltage, low current operation. The tube should never be operated without a reasonable plate load.

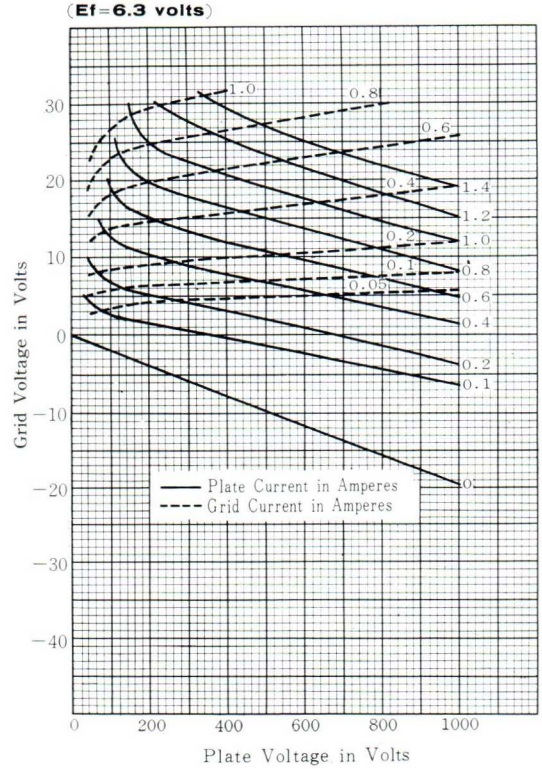
FREQUENCY CHARACTERISTICS

(Oscillation)



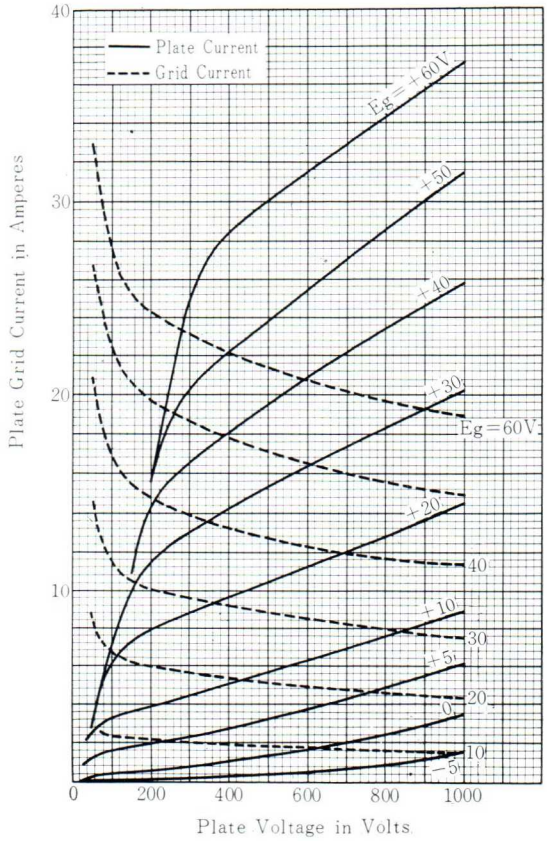
CONSTANT CURRENT CHARACTERISTICS

(Ef=6.3 volts)



AVERAGE CHARACTERISTICS

(Ef=6.3 volts)



NEC Nippon Electric Company Limited
P.O. Box 1, Takanawa, Tokyo, Japan
Cable Address: "MICROPHONE TOKYO"

Cat. No. 445-1-E
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Traveling-Wave Tube CW Amplifier NEC LD-508A

(Tentative Data Sheet)

The NEC LD-508A is a CW traveling-wave amplifier for operation over the 3.6 to 4.9 KMC.

For the upper half of this frequency range, this type tube has an average small signal gain of 31db and a saturated output power of about 16 watts. For the lower half of the frequency range, the average small signal gain is 33db and the saturated output power is about 18 watts. The construction of the tube is of the conventional helical line type employing input and output waveguide couplings.

The LD-508A is available with a light-weight periodic permanent magnet focusing system, LD-508A Mount; it is convection cooled, and operates with a collector electrode voltage that is depressed to approximately two thirds of helix voltage. This latter feature produces a significant improvement in the operating efficiency.

The design, construction, and long life expectancy of the tube make it exceptionally well suited for use in point to point, broad-band, multi-channel microwave relay system.

Feature

1. PPM Focused and Field Replaceable.
2. Depressed Collector Operation For Improved Efficiency.
3. Convection Cooled.
4. Long Life.

Characteristics

Physical

Dimensions	See outline
Weight	Tube Envelope: 0.27 Kg. Tube Mount: 5.5 Kg.
Preferred Mounting Position	Horizontal(1)
Cathode	Oxide Coated, unipotential
Connections RF Input and output	WR-187 with UG-149 A/U Flange or WR-229 with CMR-229 Flange

Electrical

Maximum Ratings(2)

Accelerating Anode Voltage	3500 Vdc
Accelerating Anode Current	0.8 mAdc
Helix Current	2.5 mAdc
Collector Voltage, min.	2000 Vdc
Collector Current	45 mAdc
Collector Dissipation	90 W
Focusing Electrode Voltage, max.	-20 Vdc
Focusing Electrode Voltage, min.	-70 Vdc
Ambient Temperature, max.	55°C
Ambient Temperature, min.	-55°C
Collector Seal Temperature	180°C

Operation

- Heater Voltage = 6.3V ; Heater Current at 6.3V = 0.7 A

Frequency	4000 MC
Accelerating Anode Voltage	3200 Vdc
Accelerating Anode Current	0.01 mAdc
Helix Voltage	2900 Vdc
Helix Current	0.3 mAdc
Collector Voltage	2000 Vdc
Collector Current	45 mAdc
Focusing Electrode Voltage	-50 Vdc
RF Output (6 mw input level)	10 W
RF Output Saturated	20 W
Noise Figure (Small Signal)	27 db
Small Signal Gain	34 db

- Cold input and output match over 600 Mc/s band with matching device adjusted . . . . . VSWR <1.4

- Hot input and output match over 600 Mc/s band without readjustment after cold input and output matching test . . . VSWR <1.6

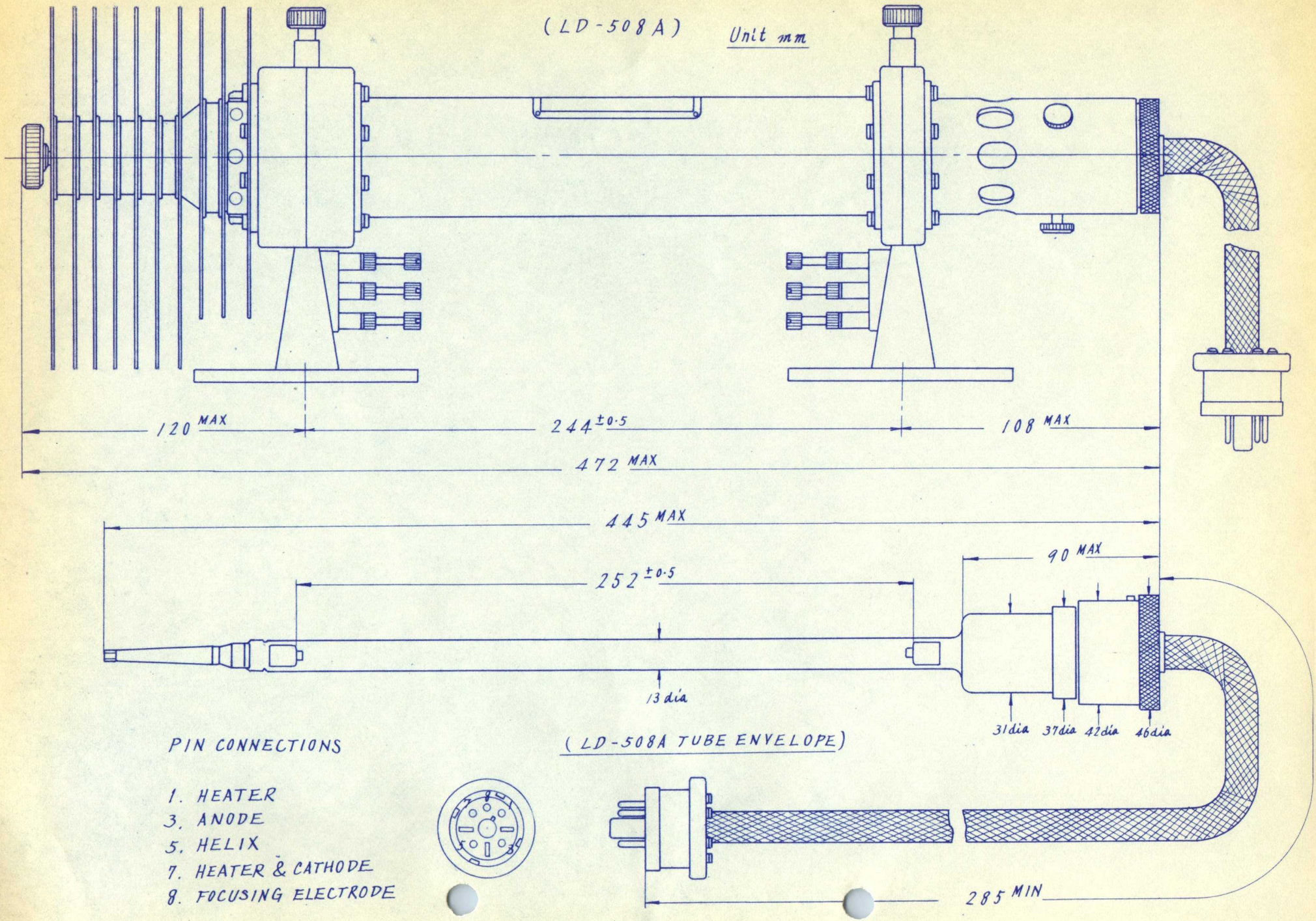
Note

1. Convection cooling is sufficient when the tube is used in a horizontal position.
   For any other mounting position it may be necessary to direct a flow of air through the cooling fins through a convection duct or other means in order to keep the collector seal temperature at a safe operating level.

2. Ratings should not be exceeded under continuous or transient conditions.
   A single rating may be the limit, and simultaneous operation at another rating may not be possible.
   Design values for systems should include a safety factor aimed at maintaining operation within ratings under voltage and environmental variations.

3. Helix current increases gradually with tube life. Warning of the end of tube life is given when helix current reaches 2.5 milliamperes.

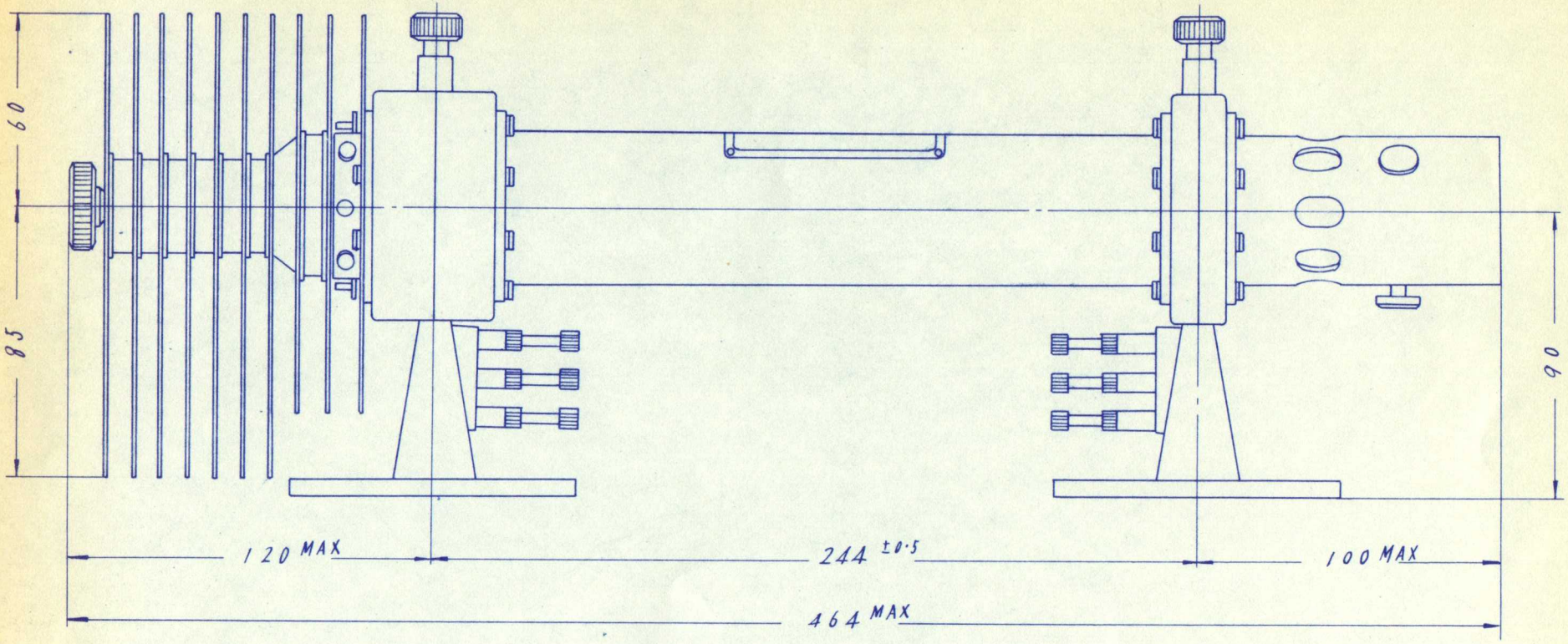
(LD-508A) Unit mm

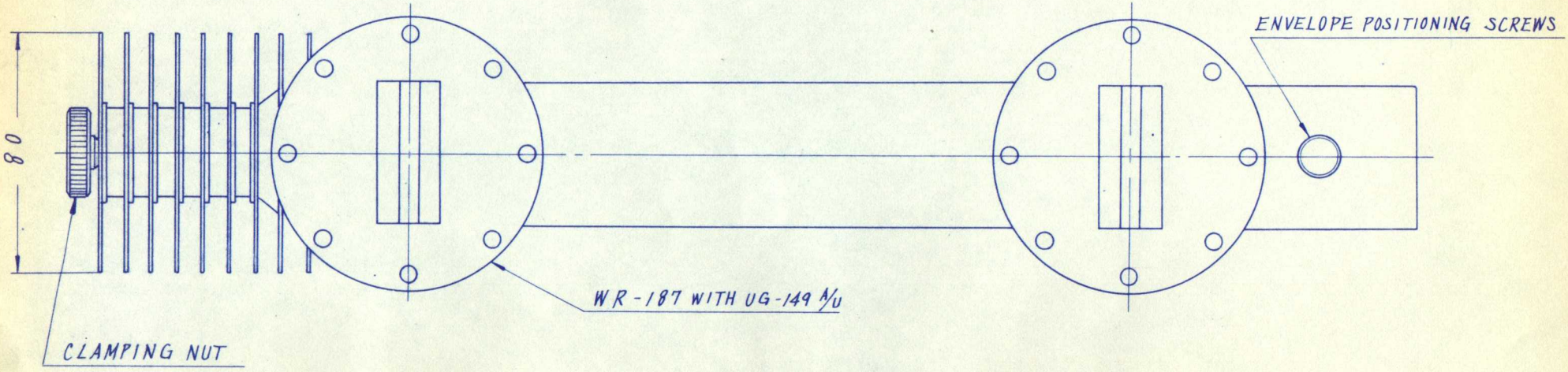


(LD-508A TUBE ENVELOPE)

PIN CONNECTIONS

1. HEATER
3. ANODE
5. HELIX
7. HEATER & CATHODE
8. FOCUSING ELECTRODE





(LD-508A MOUNT)

Unit. mm

VACUUM TUBE LD-531

GENERAL

The LD-531 high-mu planar triode is a metal-ceramic type manufactured by NEC to rigid specifications. The triode is intended for use as an oscillator, power amplifier or frequency multiplier in transmitters operating up to 2300 Mc. The planar (coaxial contact) construction provides low lead inductances and capacitances, which result in high power output at UHF. The cathode is an indirectly-heated oxide-coated disc. The anode can dissipate up to 600 watts when cooled with forced air.

CHARACTERISTICS

Electrical

Heater voltage	6.3 volts
Heater current	2.3 amps
Transconductance (I_b=200 ma ; E_b=1200 v)	45000 micromhos
Amplification factor	130
Interelectrode capacitances	
Grid-plate	3.3 pf
Grid-cathode	15.0 pf
Plate-cathode	0.1 pf max

Mechanical

Mounting position	Any
Type of cooling	Forced air
Air flow required	2 M^3/min
Net weight	650 grams

Maximum Ratings

DC plate voltage	2000 volts
DC grid voltage	-150 volts
Cathode current	400 ma
Grid current	60 ma
Plate dissipation (w/forced air cooling)	600 watts
Grid dissipation	7 watts
Frequency	2300 Mc
Seal temperature	200 °C

Typical Operation

A. RF OSCILLATOR, ~~2200~~ 2300 Mc

DC plate voltage	1700 volts
DC grid voltage	-25 volts (approx.)
Plate current	350 ma
Grid current	40 ma (approx.)
Heater voltage	4 volts
Useful power output	100 watts

Typical Operation (cont'd)

B. GROUNDED-GRID CLASS-B AMPLIFIER, 1800 Mc

DC plate voltage	1700 volts
DC grid voltage	−25 volts (approx.)
Plate current	300 ma
Grid current	15 ma (approx.)
Heater voltage	5.8 volts
Driving power	23 watts (approx.)
Bandwidth	± 2 Mc
Useful power output	110 watts

C. GROUNDED-GRID CLASS-B AMPLIFIER, 2300 Mc

DC plate voltage	1700 volts
DC grid voltage	−25 volts (approx.)
Plate current	300 ma
Grid current	15 ma (approx.)
Heater voltage	5.8 volts
Driving power	20 watts (approx.)
Bandwidth	± 2 Mc
Useful power output	65 watts

Typical Parameter Spreads

	Min.	Max.
Filament current at 6.3 volts	2.1	2.45 amps
Cut-off bias*	—	20 volts
Grid-plate capacitance**	2.8	3.8 pf
Grid-cathode capacitance**	13	17 pf

NOTES:

* Measured at 1-ma plate current and ~~600~~ 1200 volts plate voltage.

** Capacitance measured with no power applied to tube.

APPLICATION

Mechanical

In mounting the tube, care must be taken to assure firm and positive electrical contacts. The socket assembly should provide spring collets or fingers for contacting all terminals. The dimensions of the terminals are shown on the outline drawing. The tube, when inserted in a socket, should be seated at the anode flange.

Under no condition should the temperature of any of the tube seals exceed ~~200~~ 300°C. Operation at a reduced temperature will greatly extend the life and reliability of the tube. For operation at elevated plate power dissipations, an air flow of two cubic meters per minute must be provided.

Electrical

Back-heating of the cathode will occur when operation is above 400 Mc, and must be considered. Back-heating is a function of frequency, grid current, grid bias, circuit design and adjustment. However, the table below may be used as a safe rule-of-thumb under normal conditions.

Frequency	Heater voltage
Below 400 Mc	6.3 volts
400~1000 Mc	6.0 volts
1000~1500 Mc	5.5 volts
1500~2000 Mc	5.0 volts
Above 2000 Mc	4.5 volts

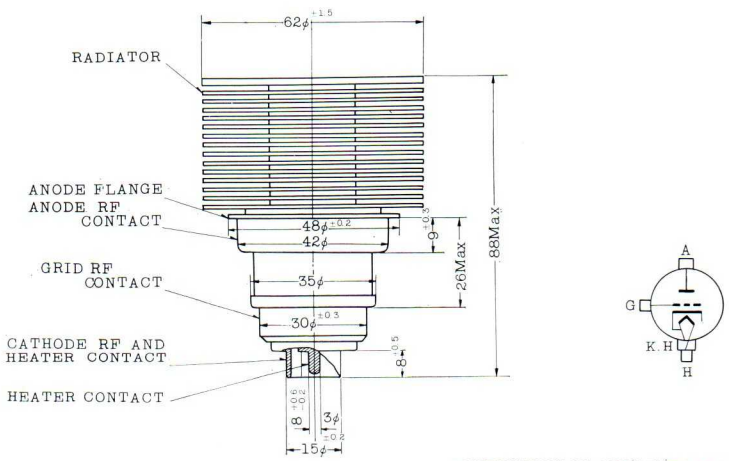
A tolerance of five-percent may be tolerated in the determination of the filament voltage.

With high-frequency circuits, a very small motion of the tuning plunger may result in high plate current and/or plate dissipation. Therefore, in practical use, it is recommended that tunep be performed at reduced plate voltage.

In the general case for amplifiers, a part of the total power supplied by the driving source will be dissipated by the grid.

To optimize tube life, the plate circuit should always be heavily loaded, and the driving power should be reduced to the lowest practical value. Generally, low-voltage-high-current operation of the LD-531 is to be preferred rather than high-voltage-low-current operation. The tube should never be operated without a plate load.

OUTLINE DRAWING (mm)



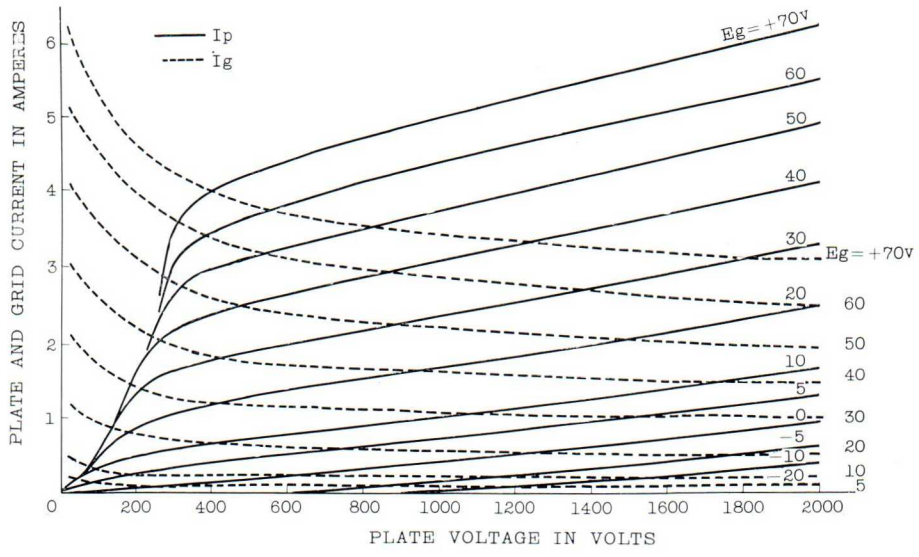
DIMENSIONS IN MILLIMETERS

LD-531

NEC

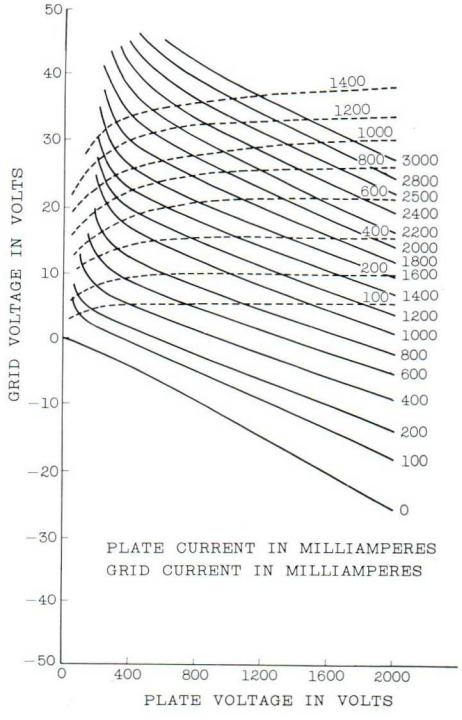
AVERAGE CHARACTERISTICS

(Ef = 6.3 volts)



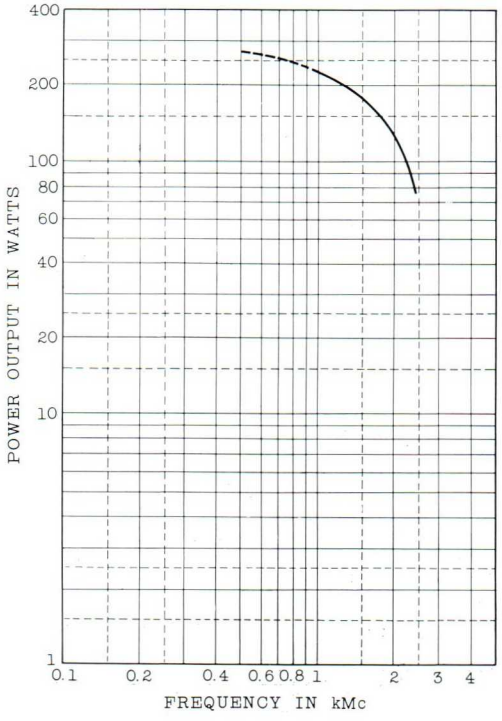
CONSTANT CURRENT CHARACTERISTICS

(Ef = 6.3 volts)



FREQUENCY CHARACTERISTICS

(Oscillation)



Nippon Electric Company Limited
P.O. Box 1, Takanawa, Tokyo, Japan
Cable Address: "MICROPHONE TOKYO"

Cat. No. 445-3-E
6208-1000-M
Printed in Japan

LD-550

NEC MICROWAVE TUBES

S H F PACKAGE-TYPE TRAVELING WAVE TUBE

The type LD-550 is a travelling wave amplifier and oscillator for C.W. operation over the 5,800 to 8,200 Mc range.

It is capable of delivering a saturated output power of more than 10 watts in the frequency range of 5,800~7,500 Mc and more than 5 watts in the frequency range of 7,500~8,200 Mc.

It is a conventional helical line type tube employing waveguide input and output coupling. The focusing system of this tube consists of a novel magnetic circuit and a conventional periodic magnetic field system which are packaged in cylindrical cases together with input and output waveguides and the tube itself, so the complete assembly is remarkably compact and light weight.

The collector voltage is depressed to about one half of the helix voltage and the tube is convection cooled. An efficient heat transfer of the collector is effected by the dimensions and the number of cooling fins.

GENERAL CHARACTERISTICS

Cathode	Oxide-coated, indirectly heated
Heater Voltage	6.3 Volts
Heater Current	0.73 Amperes

MAXIMUM RATINGS

Focusing Electrode Voltage	-60 Volts
1 st Anode Voltage	3,400 Volts
Helix Voltage (2 nd Anode Voltage)	3,400 Volts
Collector Voltage	1,700 Volts
Collector Current	35 Milliamperes
Helix Current (2 nd Anode Current)	4 Milliamperes
1 Anode Current	1 Milliamperes
Collector Seal Temperature	130°C

MECHANICAL CHARACTERISTICS

Mounting position	Horizontal
Net Weight	5 kgs.
Cooling	Natural
Waveguide Conductors	WR 137 fitted with UG 344 cover flange

TYPICAL OPERATING DATA

Frequency	6,150 Mc	7,650 Mc
Focusing Electrode Voltage	-30 Volts	-30 Volts
1 st Anode Voltage	2,500 Volts	2,500 Volts
Helix Voltage (2 nd Anode Voltage)	3,300 Volts	3,200 Volts
Helix Current (2 nd Anode Current)	0.3 mA	0.3 mA
Collector Current	35 mA	35 mA
Collector Voltage	1,600 Volts	1,600 Volts
R.F. Output (at 4 mW input level)	8.5 Watts	6 Watts
Saturated Power Output	12 Watts	10.5 Watts
Noise Figure	25 db	

Cold input and output match with matching device adjusted

At 6,150 Mc/s VSWR 1.02

At ±15 Mc/s about 6,150 Mc/s VSWR<1.1

PRECAUTIONS

1. Care should be taken to avoid shock damage to the tube and the input and output waveguides. For the installation of this tube, it is desirable to use flexible waveguide section to which the tube is connected.
2. The screws used to fix the tube elemenets should never be moved.
3. The first anode voltage should not be applied before the focusing electrode, helix and collector voltage reach the specified values.
4. The tube body is connected to the collector electrode internnally, so it is recommended that the body be kept at ground potential.

OPERATIONAL SEQUENCE

1. Bolt the tube securely to the matching waveguide flanges. Do not distort the tube capsule on the mounting to avoid damage of the glass envelope.
2. Apply heater voltage and allow 90 seconds minimum warm up.
3. Apply the specified voltage to the focusing electrode, collector and helix voltage in that order.
4. Increase the 1 st anode voltage until the rated collector current is reached.
5. Trim the helix voltage for optimum operation.

TUNING PROCEDURE

Two short plungers provided in the input and output waveguides are used to tune the tube roughly to the external circuits.

When fine adjustment of impedance matching at input and output circuits required, trim matching screws on the waveguides.

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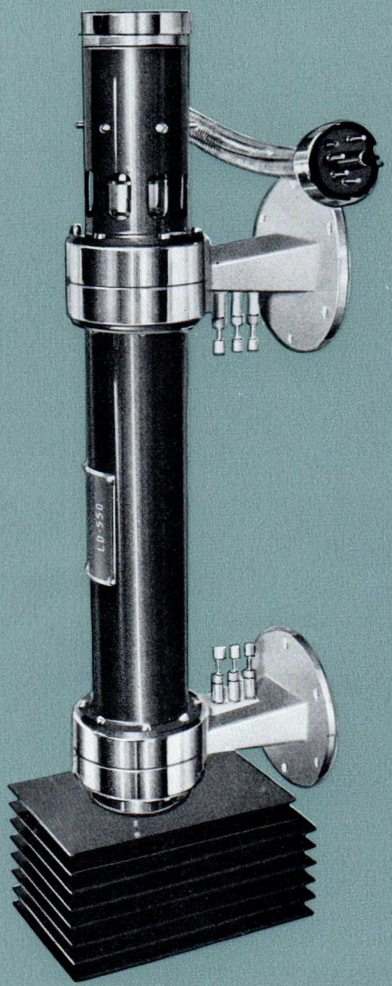
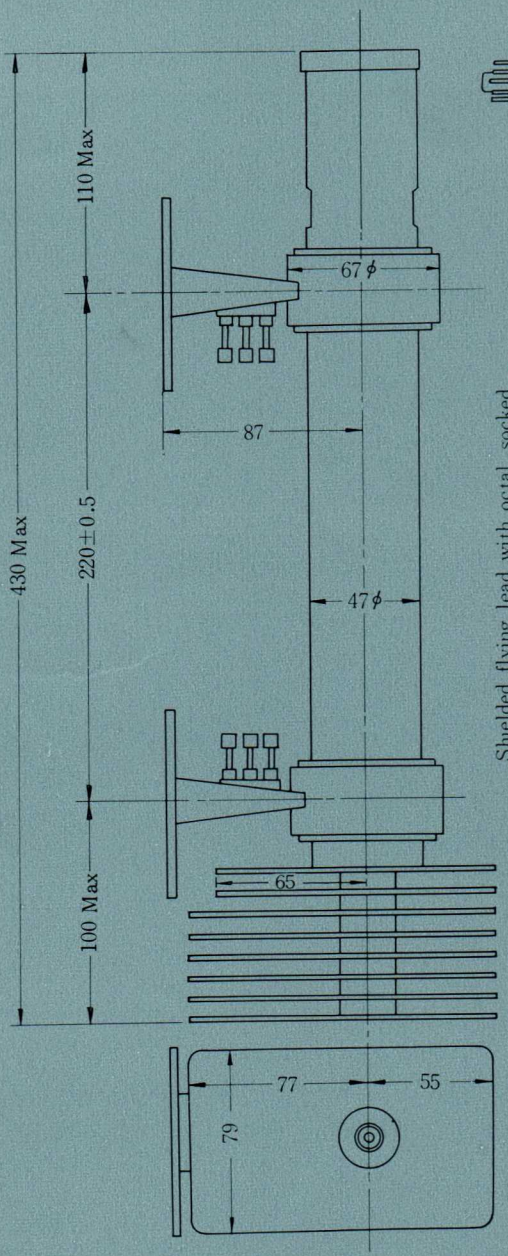
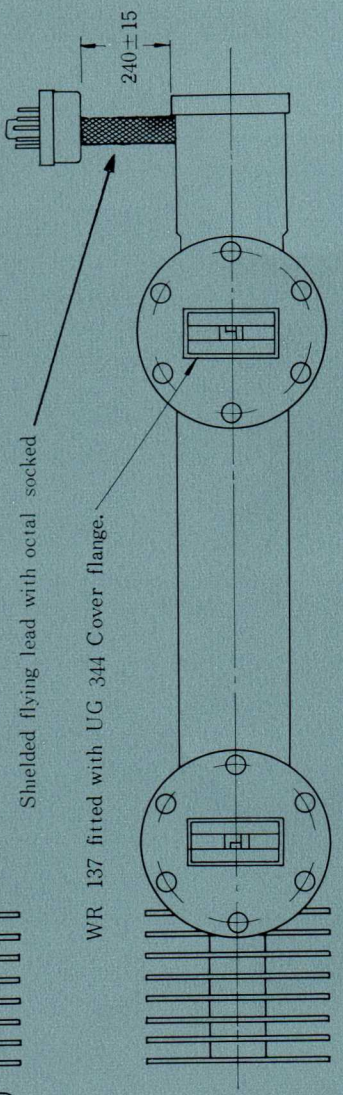
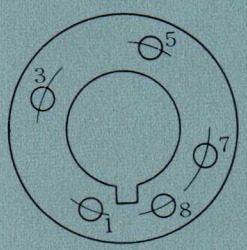
Cat. No. 443-3-E

NEC MICROWAVE TUBES



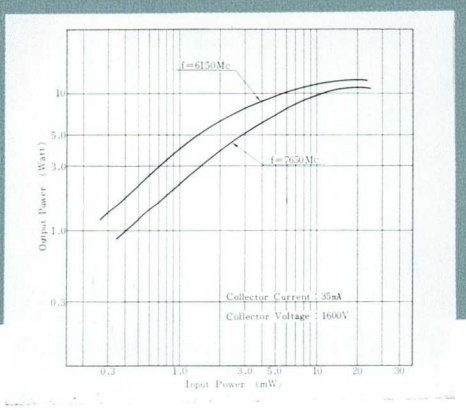






Note

1 Heater
3 1st Anode
5 Helix
7 Heater and Cathode
8 Focusing Electrode

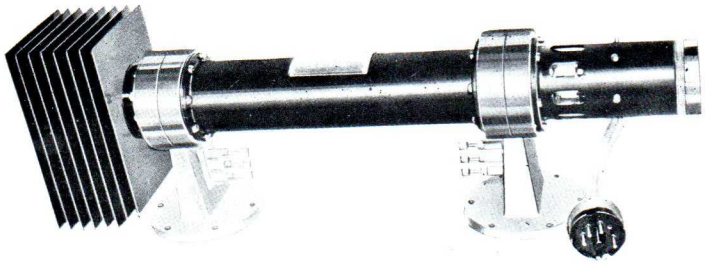


NEC *Nippon Electric Company Ltd.*

Head Office 2, Shiba Mita Shikoku-machi, Minato-ku, Tokyo, Japan
Tel. Tokyo 451-1171(9) • 5121(9) • 5221(9)
Cable Address "MICROPHONE TOKYO"

TRAVELING-WAVE TUBE LD-550

GENERAL



The LD-550 is a CW traveling-wave amplifier designed for operation in a frequency range of 5.8 to 8.2 kMc. For the upper half of this frequency range, this tube has an average small signal gain of 32 db and a saturated output power of about 8 watts. For the lower half of the frequency range, the average small signal gain is 35 db and the saturated output power is about 10 watts. The tube is of a conventional helical line construction employing input and output waveguide couplings. These couplings have integral tapered waveguide adaptors with adjusting screws for impedance matching. The LD-550 uses integral permanent magnet focusing. It is convection cooled, and operates with a collector electrode voltage that is depressed to approximately one-half of the helix voltage. The latter feature produces a significant improvement in the operating efficiency. The design, construction and durability of the tube make it exceptionally well suited for use in point-to-point, broad-band, multichannel microwave relay equipment.

FEATURES

- Depressed Collector Operation for Improved Efficiency
- Convection-Cooled
- PPM Focused
- Durability

CHARACTERISTICS

Electrical

MAXIMUM RATINGS*

Accelerating anode voltage	3400 v ~~1400 v~~
Accelerating anode current	1.0 ma
Helix voltage	3400 v
Helix current**	1.0 ma
Collector voltage,*** min	1600 v
Collector current	35 ma
Collector dissipation	56 w
Focusing electrode voltage	−50 v
Ambient temperature	55°C
Ambient temperature, min	−55°C
Collector seal temperature	130°C

Physical

GENERAL

Dimensions	See outline drawing
Weight	11 lbs
Preferred mounting position****	Horizontal
Cathode	Oxide coated, unipotential
(Minimum heating time	90 sec)

OPERATION

HEATER VOLTAGE = 6.3 v
HEATER CURRENT AT 6.3 v = 0.73 v

Frequency	6.15	7.65 kMc
Accelerating anode voltage	2500	2500 v ~~1500 v~~
Helix voltage	3300	3200 v
Helix current	0.3	0.3 ma
Collector voltage	1600	1600 v
Collector current	35	35 ma
Focusing electrode voltage	−30	−30 v
RF output (8-mw input level)	10	9 w
Noise figure (small signal)	<25	<25 db
Small signal gain (1-mw input)	33	33 db

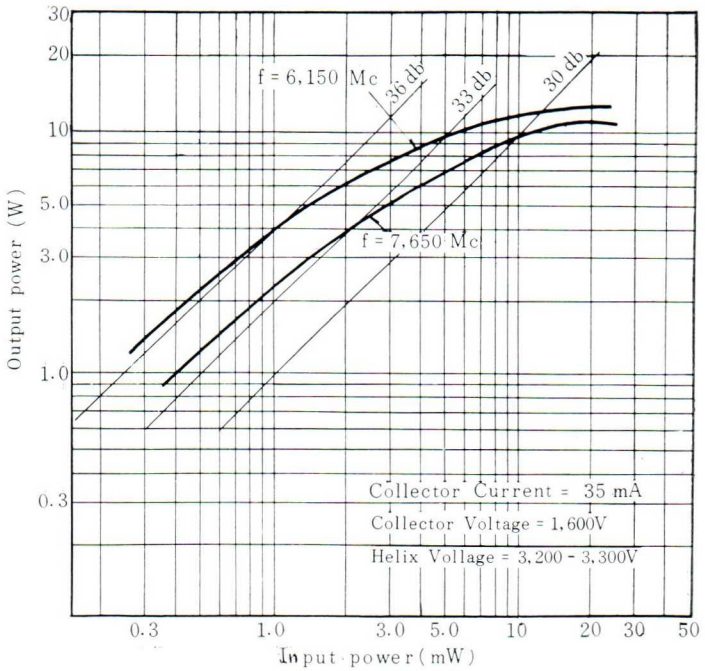
NOTES:
* Ratings should not be exceeded under continuous or transient conditions. A single rating may be the limitation and simultaneous operation at another rating may not be possible. Design values for systems should include a safety factor to maintain operation within ratings under voltage and environmental variations.
** Helix current increases gradually with tube life. Impending termination of tube life is indicated when the helix current reaches 2 milliamperes.
*** No RF drive power should be used during installation and voltage adjustments on the tube. Under these conditions brief excursions of the collector current up to 40 milliamperes will not damage the tube.
**** Convection cooling is sufficient when the tube is used in a horizontal position. For any other mounting position it may be necessary to direct some air flow through the cooling fans in order to keep the collector seal temperature at a safe operating level.

MOUNTING

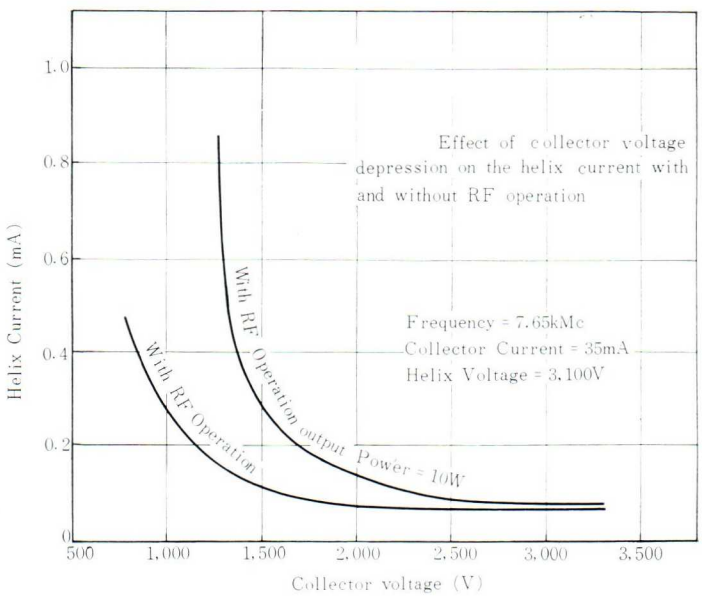
The optimum arrangement for mounting the LD-550 is to provide a mounting clamp in the center of the tube between the two waveguides and then use flexible waveguides for the input and output connectors. A satisfactory alternate arrangement is to use a fixed waveguide for the output connector, supporting the tube at this point, and then use a flexible waveguide for the input connector.

CHARACTERISTIC CURVES

All curves are of average value



INPUT POWER vs. OUTPUT POWER

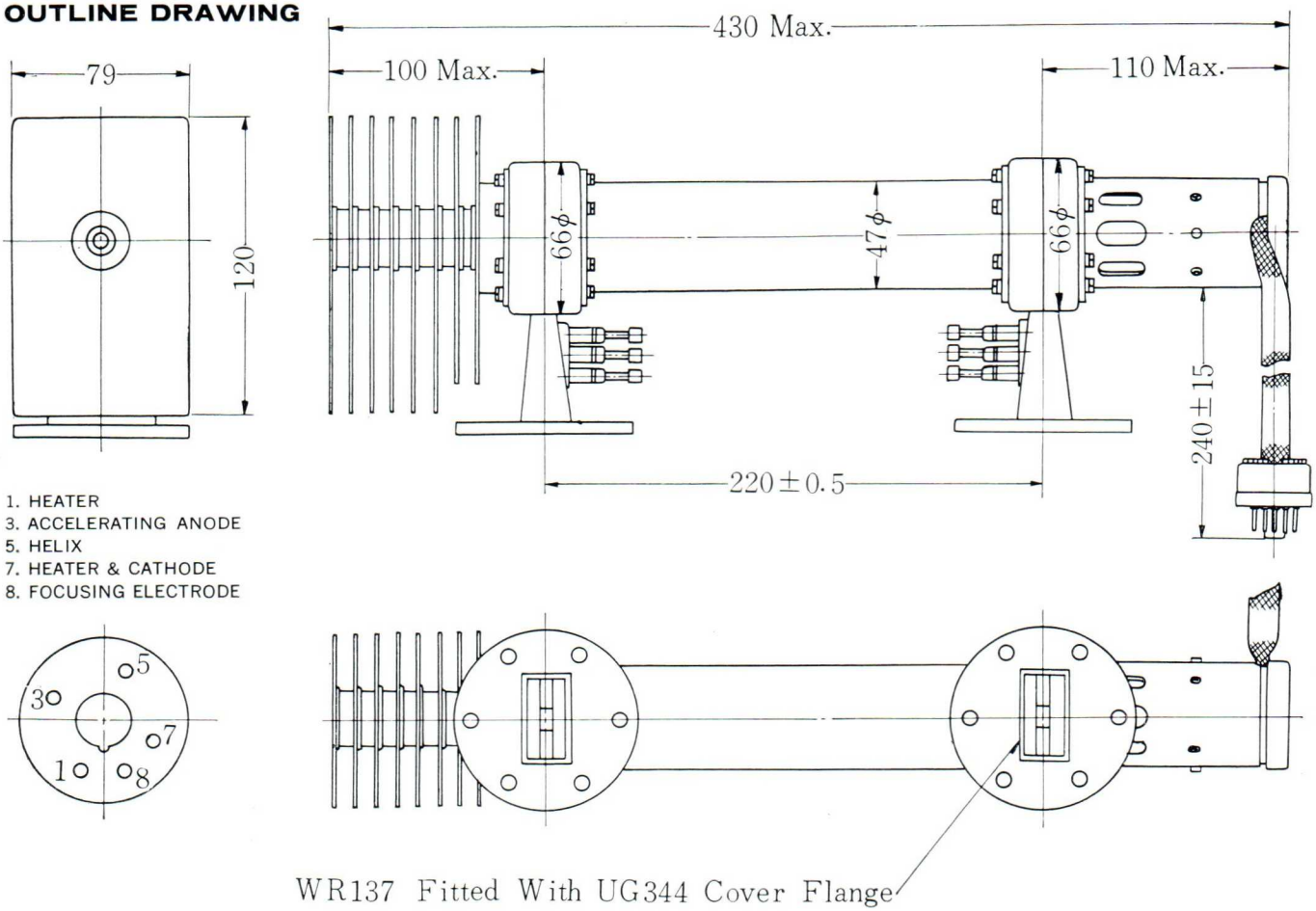


HELIX CURRENT vs. COLLECTOR VOLTAGE

LD-550

NEC

OUTLINE DRAWING



1. HEATER
3. ACCELERATING ANODE
5. HELIX
7. HEATER & CATHODE
8. FOCUSING ELECTRODE

WR137 Fitted With UG344 Cover Flange

NEC Nippon Electric Company Limited
P.O. Box 1, Takanawa, Tokyo, Japan
Cable Address: "MICROPHONE TOKYO"

Cat. No. 443-3-E
6208-1000-M
Printed in Japan

VES-3410

Nippon Electric Co., Ltd.
3/11/63

Traveling Wave Tube CW Amplifier NEC LD-550A

(Tentative Data Sheet)

The NEC LD-550A is a CW traveling-wave amplifier for operation over a frequency range of 5.8 to 8.2 kMc. For the upper half of this frequency range, this type tube has an average small signal gain of 30 db and a saturated output power of about 8 watts. For the lower half of the feq-ency range, the average small signal gain is 33db and the saturated output power is about 10 watts. The construction of the tube is of the conventional helical line type employing input and output waveguide couplings.

The LD-550A is available with a light-weight periodic permanent magnet focusing system, LD-550A Mount; it is convention-cooled, and operates with a collector electrode voltage that is depressed to approximately one half of the helix voltage. This latter feature produces a significant inprovement in the operating efficiency.

The design, construction, and long life expectancy of the tube wake it exceptionally well suited for use in point-to-point, broad-band, or multi-channel microwave relay equipments.

Features

1. PPM Focused and Field Replaceable.
2. Depressed Collector Operation For Improved Efficiency.
3. Convection Cooled.
4. Long Life.

Characteristics

Physical

Dimensions - - - - - - - - - - - - - - - - See Outline

Weight - - - - - - - - - - - - - - -	Tube Envelope:	0.25 Kg.
	Tube Mount:	4.6 Kg.
Preferred Mounting Position - -	Horizontal 1	
Cathode - - - - - - - - - - - - - -	Oxide coated, unipotential	
Connections		
RF Input & Output - - - - - - - -	WR-137 with UG-344/U flange	

Electrical

Maximum Ratings 2

Accelerating Anode Voltage - - - - - - - - - - - -	3400 V
Accelerating Anode Current - - - - - - - - - - - -	1.0 mA
Helix Voltage - - - - - - - - - - - - - - - - - - -	3400 V
Helix Current 3 - - - - - - - - - - - - - - - - - -	1.0 mA
Collector or Voltage, min. - - - - - - - - - -	1600 V
Collector Current - - - - - - - - - - - - - - - -	35 mA
Collector Dissipation - - - - - - - - - - - - - -	56 W
Focusing Electrode Voltage, max. - - - - - - - -	-20 V
Focusing Electrode Voltage, min. - - - - - - - -	-60 V
Ambient Temperature, max. - - - - - - - - - - - -	55°C
Ambient Temperature, min. - - - - - - - - - - - -	-55°C
Collector Seal Temperature - - - - - - - - - - -	130°C

Operation

- Heater Voltage = 6.3 V; Heater Current at 6.3 V = 0.73A
- Frequency - 6860 ± 15 Mc
- Accelerating Anode Voltage - - - - - - - - - - - 2500 V
- Accelerating Anode Current - - - - - - - - - - - 0.01 mA
- Helix Voltage - - - - - - - - - - - - - - - - - - 3100 V
- Helix Current - - - - - - - - - - - - - - - - - - 0.3 mA

- Collector Voltage - - - - - - - - - - - - - - - - - 1600 V
- Collector Current - - - - - - - - - - - - - - - - - 35 mA
- Focusing Electrode Voltage - - - - - - - - - - - -30 V
- RF Output (3 mW input level) - - - - - - - - - - 5 W
- RF Output Saturated - - - - - - - - - - - - - - - 11 W
- Noise Figure (Small Signal) - - - - - - - - - - 27 db
- Small Signal Gain - - - - - - - - - - - - - - - - 33 db
- Cold and hot input match over 30 Mc/s band with matching device adjusted - - - - - - - - - - - - VSWR $<$ 1.1
- Cold output match over 30 Mc/s band with matching device adjusted - - - - - - - VSWR $<$ 1.1
- Hot output match over 30 Mc/s band with matching device adjusted - - - - - - - VSWR $<$ 1.2
- Gain Linearity over 30 Mc/s band - - - - - - - - 0.2 db

Note

1. Convection cooling is sufficient when the tube is used in a horizontal position. For any other mounting position it may be necessary to direct a flow of air through the cooling fins through a convection duct or other means in order to keep the collector seal temperature at a safe operating level.
2. Ratings should not be exceeded under continuous or transient conditions. A single rating may be the limit, and simultaneous operation at another rating may not be possible.

   Design values for systems should include a safety factor aimed at maintaining operation within ratings under voltage and environmental variations.
3. Helix current increases gradually with tube life. Warning of the end of tube life is given when helix current reaches 2 milliamperes.

METAL-CERAMIC-SEALED HIGH-MU PLANAR UHF TRIODE LD-551

GENERAL

The LD-551 is a metal-ceramic-sealed high-mu planar UHF triode, originally manufactured by NEC for use as an oscillator, a power amplifier, or a frequency multiplier in radio transmitting service at frequencies ranging up to 2100 Mc.

The LD-551 features include low lead inductances and capacitances, a high transconductance and a high power output in ultra-high frequencies. The cathode is an indirectly-heated oxide-coated disc. The anode can dissipate 2100 watts with forced-air cooling.

GENERAL CHARACTERISTICS

ELECTRICAL

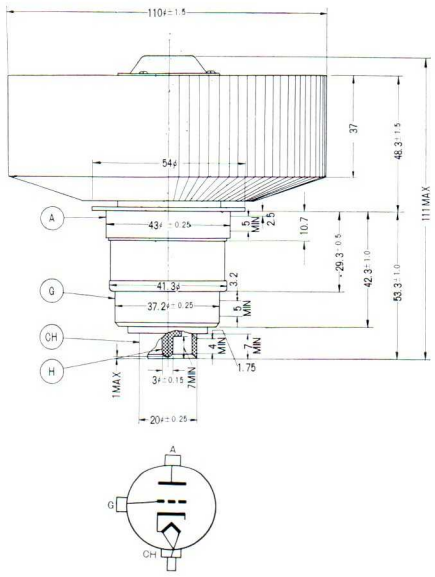
Heater Voltage	6.3 volts
Heater Current	3.6 amps
Transconductance (I_b=300 ma, E_b=2000 volts)	50 millimhos
Amplification Factor	110
Interelectrode Capacitances	
Grid-Plate	5 $\mu\mu$f
Grid-Cathode	20 $\mu\mu$f
Plate-Cathode	0.1 $\mu\mu$f max

MECHANICAL

Mounting Position	Any
Type of Cooling	Forced-air
Required Air Flow on Anode	7 m^3/min
Approximate Net Weight	1.5 kg

PHYSICAL DIMENSIONS

(in millimeters)



A=Anode
G=Grid
CH=Cathode Heater
H=Heater

LD-551

NEC

MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS (RF Power Amplifier and Oscillator)

Maximum Ratings

DC Plate Voltage	3000 volts
DC Grid Voltage	−175 volts
DC Cathode Current	830 ma
DC Grid Current	130 ma
Plate Dissipation (forced-air cooling)	2100 watts
Grid Dissipation	10 watts
Frequency	2100 Mc
Seal Temperature	200°C

Typical Operating Data

RF OSCILLATOR (I), 1000 Mc

DC Plate Voltage	3000 volts
DC Grid Voltage (approx)	−38 volts
DC Plate Current	700 ma
DC Grid Current (approx)	60 ma
Useful Power Output	850 watts

RF OSCILLATOR (II), 1000 Mc

DC Plate Voltage	2200 volts
DC Grid Voltage (approx)	−32 volts
DC Plate Current	750 ma
DC Grid Current (approx)	50 ma
Useful Power Output	650 watts

RF OSCILLATOR (III), 2000 Mc

DC Plate Voltage	2100 volts
DC Grid Voltage (approx)	−30 volts
DC Plate Current	800 ma
DC Grid Current (approx)	50 ma
Useful Power Output	300 watts

CLASS-B AMPLIFIER IN GROUNDED-GRID CIRCUIT AT 800 Mc

DC Plate Voltage	3000 volts
DC Grid Voltage (approx)	−40 volts
DC Plate Current	780 ma
Driver Power Output (approx)	100 watts
Useful Power Output (approx)	950 watts

NEC Nippon Electric Company Limited
P.O. Box 1, Takanawa, Tokyo, Japan
Cable Address: "MICROPHONE TOKYO"

Cat. No. 445-4-E
6302-1000-M
Printed in Japan

S-Band Low Noise Traveling Wave Tube LD-570, Developmental Type

(Preliminary and Tentative Data)

The LD-570 is suitable for a microwave preamplifier stage where low noise figure is required. The LD-570 has a maximum noise figure of 6.5 db and a minimum small signal gain of 20db, and is used over the frequency band of 2,700 to 2,900 MC/S without readjustment of tuning devices. Application of this tube include radar receivers, electronic counter-measure equipment, microwave relay systems and so on.

General Characteristics:

Electrical

Heater Voltage	4 to 7 V
Heater Current	0.7 A Max.
Frequency Range	2700 to 2900 MC/S
Noise Figure	6.5 db Max.
Small Signal Gain	20 db Min.
Input and Output VSWR	2.0 Max.

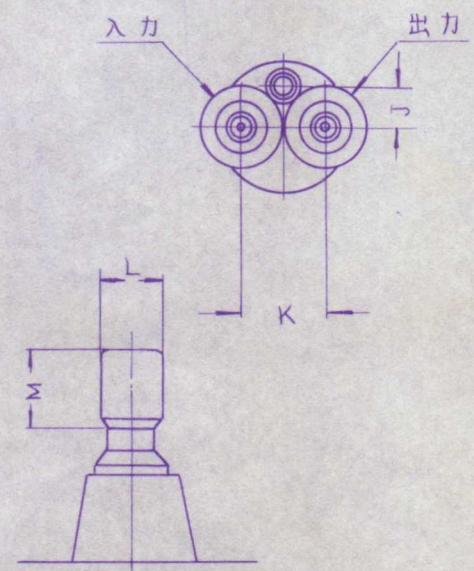
Mechanical

Mountaing Position	Any
Input & Output	Coaxial Connector, Type N Plugs
Socket	Octal base
Collector Connector	Special size
Dimension	See Outlien Drawing
Weight	850 grs.
Cooling	Not required

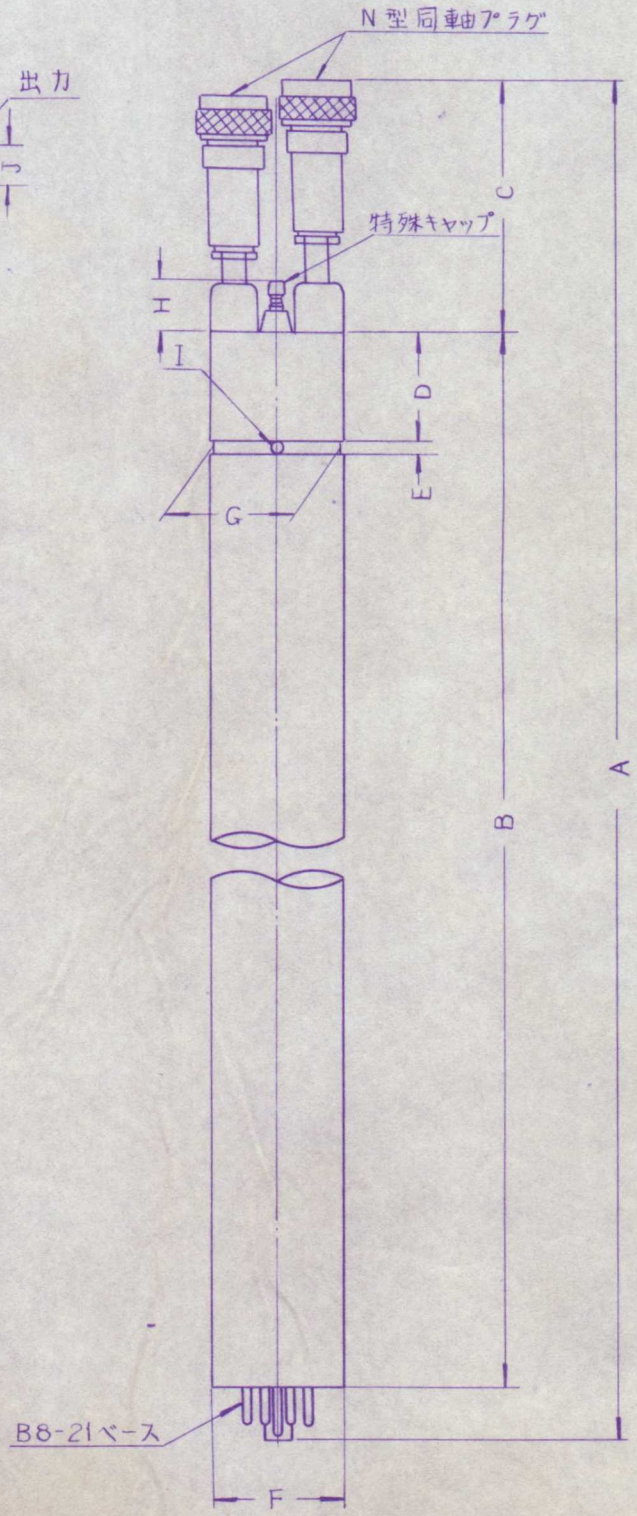
Typical Operation

Frequency	2800 MC/S
Heater Voltage	6.0 V
Heater Current	0.5 A
Grid Voltage	0 V
Anode 1 Voltage	19.7 V
Anode 2 Voltage	41 V
Anode 3 Voltage	300 V
Helix Voltage	437 V
Helix Current	0.1 μA
Collector Voltage	700 V
Collector Current	200 μA
Magnetic Field Strengh	650 gauss
Noise Figure	5.5 db
Small Signal Gain	32 db
Saturated Power Output	3 mW

LD-570 付図



キャップ詳細図



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△△△ D	28.5	29.5
E	3	
△△△ F	34.8	35.8
G	33.6	
H	14	
I	3φ 孔	
J	10	
** K	21.5	23.5
L	4φ	
M	5	

X-Band Low Noise Traveling Wave Tube

LD-571, Developmental Type

(Preliminary and Tentative Data)

The LD-571 is suitable for a microwave preamplifier stage where low noise figure is required. The LD-571 has a maximum noise figure of 8.5 db and a minimum small signal gain of 20 db, and is used over the frequency band of 8,500 to 9,500 MC/S without readjustment of tuning devices. Application of this tube include rader receivers, electrical counter-mesure equipments, microwave relay systems and so on.

General Characteristics

Electrical

Heater Voltage	4 to 7 V
Heater Current	0.7 A
Frequency range	8,500 to 9,500 MC/S
Noise Figure	8.5 db Max.
Small Signal Gain	20 db Min.
Input and Output VSWR	2.0 Max.

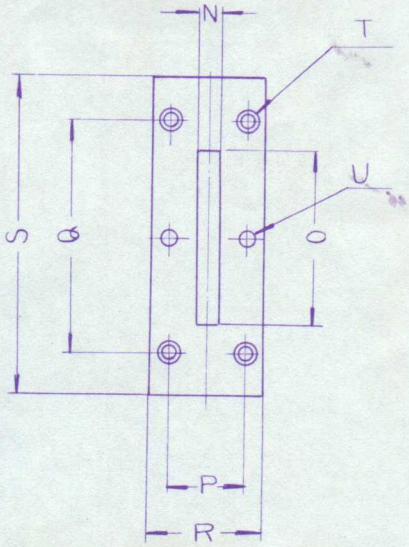
Mechanical

Mountaing Position	Any
Input & Output	Reduced Height of RG-52/U Special flange
Socket	Octal base
Collector Connector	Special size
Dimension	See Outline Drawing
Weight	800 grs.
Cooling	not required

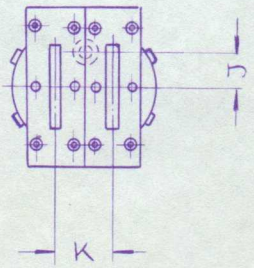
Typical Operation

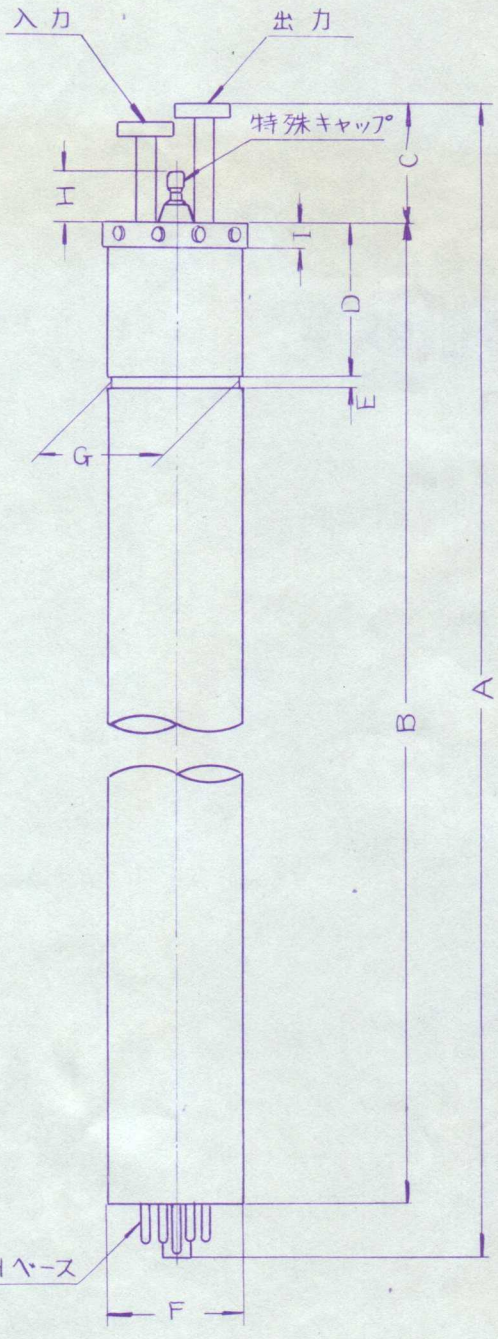
Frequency	9,080	MC/S
Heater Voltage	6.0	V
Heater Current	0.50	A
Grid Voltage	-5.0	V
Anode 1 Voltage	22.2	V
Anode 2 Voltage	115	V
Anode 3 Voltage	550	V
Helix Voltage	840	V
Helix Current	0.3	µA
Collector Voltage	1200	V
Collector Current	200	µA
Magnetic Field Strengh	700	Gauss
Noise Figure	6.4	db
Small Signal Gain	23	db
Saturated Power Output	2.4	mW

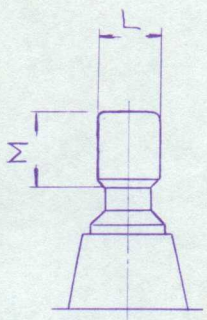
LD-571 付図



導波管フランヂ詳細図







キャップ詳細図

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F	34.8	35.8
G	33.6	
H	13	
I	6	
J	9	
K	15	
L	4	
M	5	

記号	寸法 最小	寸法 最大
N	3	
O	22.9	
P	10	
Q	31	
R	15	
S	42	
T	4-3$^{\phi}_{-0.6}$P	
U	2-3.2$^{\phi}$	

HIGH-MU PLANAR TRIODE LD-583

GENERAL

The LD-583 high-mu planar triode is a metal-ceramic type manufactured by NEC to rigid specifications. The triode is intended for use as an oscillator, a power amplifier or a frequency multiplier for radio transmitting service in frequencies ranging up to 2500 Mc. Triode features include low lead inductances and capacitances, high transconductance, and high plate dissipation. The cathode is an indirectly-heated oxide-coated disc. The anode is cooled by forced-air and is capable of dissipating 130 watts.

Exterior dimensions of LD-583 are the same as LD-497.

CHARACTERISTICS

ELECTRICAL

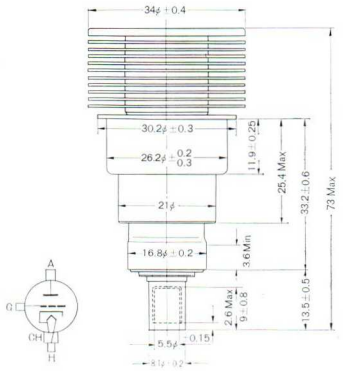
Heater Voltage (see application)	6.3 volts
Heater Current	1.3 amps
Transconductance (I_b=120 ma, E_b=600 volts)	36 millimhos
Amplification Factor	90
Interelectrode Capacitances	
Grid-Plate	2.2 $\mu\mu$f
Grid-Cathode	10.0 $\mu\mu$f
Plate-Cathode	0.08 $\mu\mu$f max

MECHANICAL

Mounting Position	Any
Type of Cooling	Forced-air
Required Air Flow on Anode	0.4 m^3/min
Maximum Seal Temperature	~~150°C~~ 200°C
Net Weight	90 grams

PHYSICAL DIMENSIONS

(in millimeters)



A = Anode
G = Grid
CH = Cathode Heater
H = Heater

MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS (RF Power Amplifier and Oscillator)

Maximum Ratings

DC Plate Voltage	1000 volts
DC Grid Voltage	−150 volts
DC Cathode Current	200 ma
DC Grid Current	60 ma
Peak Positive RF Grid Voltage	30 volts
Peak Negative RF Grid Voltage	−400 volts
Plate Dissipation (Forced-Air Cooling)	130 watts
Grid Dissipation	3 watts
Frequency	2500 Mc

Typical Operating Data

RF OSCILLATOR, 2500 Mc

DC Plate Voltage	900 volts
DC Grid Voltage	−20 volts
DC Plate Current	140 ma
DC Grid Current	40 ma
Useful Power Output	31 ~~30~~ watts

CLASS-C AMPLIFIER IN GROUNDED-GRID CIRCUIT AT 1800 Mc

DC Plate Voltage	880 volts
DC Grid Voltage	−22 volts
DC Plate Current	140 ma
DC Grid Current (Approx)	10 ma
Driver Power Output (Approx)	4 watts
Useful Power Output (Approx)	28 watts

Characteristic Range Values for Equipment Design

	Min	Max	Unit
Filament Current at 6.3 volts	1.25	1.4	amp
*Cut-off Bias	—	−15	volt
**Grid-Plate Capacitance	2.0	2.4	$\mu\mu$f
**Grid-Cathode Capacitance	8.0	12	$\mu\mu$f

Note: *Measured at 1 ma of plate current and a plate voltage of 600 volts

**Capacitance measured at cold state of the tube

APPLICATION

Mechanical

MOUNTING

In mounting the tube care must be taken to secure good electrical contacts. For this purpose, it is strongly recommended that anode, grid, cathode and heater terminals of the tube should ride against spring collets or spring fingers. Details on contacting surface of terminals will be shown in the illustration.

The tube, when in the socket, should be seated against the anode flange.

COOLING

Temperature of plate, grid and cathode seals should not exceed ~~150~~ 200°C under any operating condition. Tube life and reliability will be enhanced when all seals are properly cooled at all times. An air flow through cowling of 0.4 cubic meter per minute is recommended for the anode radiator for operation up to the rated maximum dissipation.

Electrical

HEATER VOLTAGE

When back-heating of the cathode occurs in operations exceeding 400 Mc, it merits consideration. Back-heating depends upon frequency, grid current, grid bias, circuit design and adjustment. However, the following table can be safely used as a rule of thumb under normal conditions to offset back-heating effects;

Operating Frequency	Heater Voltage E_f
Below 400 Mc	6.3 volts
400 to 1000 Mc	6.0 volts
1000 to 1500 Mc	5.5 volts
1500 to 2000 Mc	5.0 volts
Above 2000 Mc	4.5 volts

A tolerance of plus or minus 5 per cent may be allowed for the above recommended heater voltage values.

CIRCUIT TUNING

With high-frequency circuits, a very small motion of a tuning plunger may throw the tube out of resonance and result in a high plate current and/or an excessive anode dissipation. For practical use, it is recommended that provision be made for tuneup at a reduced plate voltage.

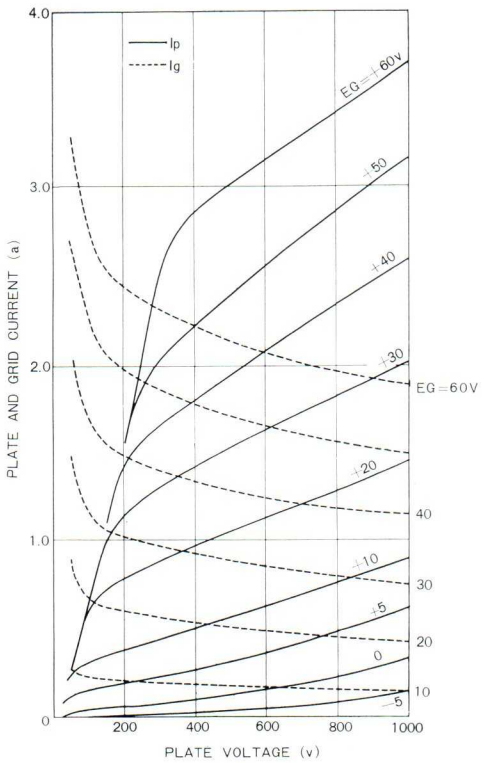
DRIVING POWER

In general, a part of the total power supplied by the driving source will appear as grid dissipation; the remainder is mainly absorbed by circuit losses.

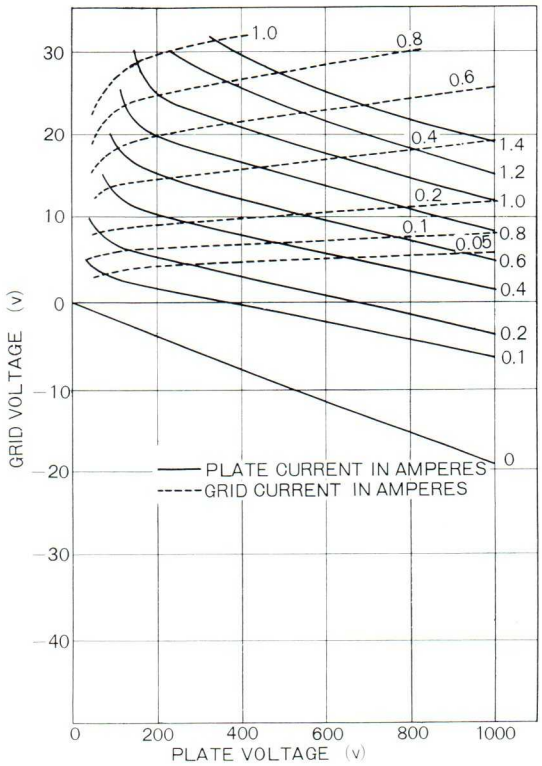
For optimum tube life, the plate circuit should be heavily loaded and the driving power should be reduced to the lowest value consistent with reasonable efficiency.

In general, low-voltage high-current operation is preferable to high-voltage low-current operation. The tube should never be operated without a reasonable plate load.

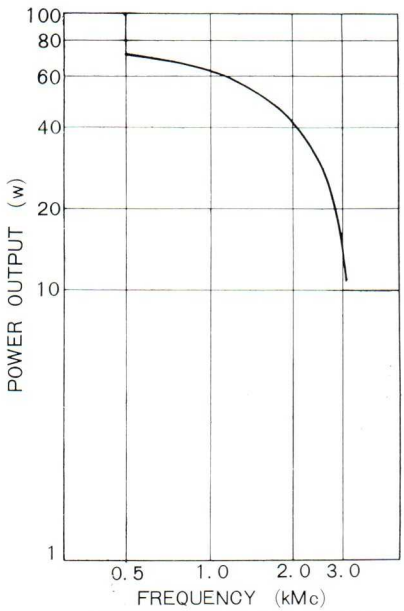
CHARACTERISTIC CURVES



AVERAGE CHARACTERISTICS (E_f=6.3 volts)



CONSTANT CURRENT CHARACTERISTICS
(E_f=6.3 volts)



FREQUENCY CHARACTERISTICS
(OSCILLATION)

NEC Nippon Electric Company Limited
P.O. Box 1, Takanawa, Tokyo, Japan
Cable Address: "MICROPHONE TOKYO"

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Nippon Electric Company Ltd.

Head Office
2, Shiba Mita Shikoku-machi, Minato-ku, Tokyo, Japan
Tel. Tokyo 45–1171 (9) • 5121 (9) • 5221 (9)
Cable Address " MICROPHONE TOKYO "

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