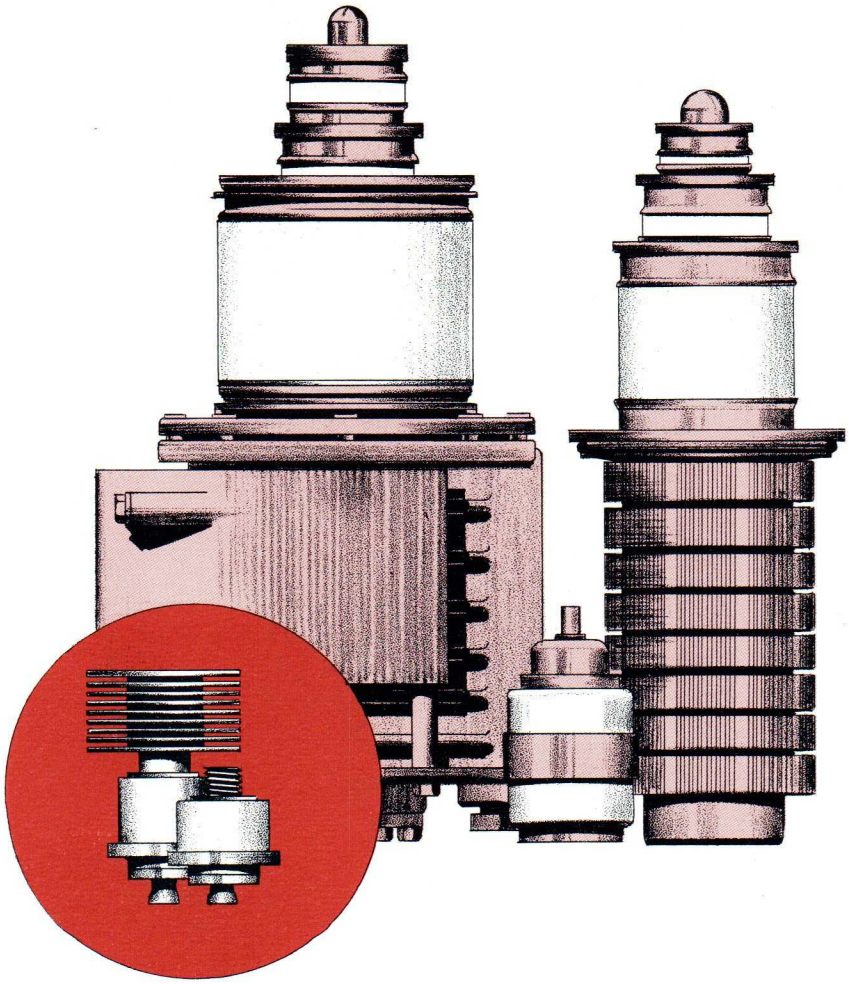
MACHLETT

electron tubes



MACHLETT

MACHLETT

table of contents
machlett electron tubes

for quick reference

large power tubes

uhf planar triodes

high vacuum diodes

vacuum capacitors, variable

vapor cooling systems

accessories

image intensifier tubes

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MACHLETT ELECTRON TUBES

High power triodes and tetrodes for general purpose applications and pulse modulation.
High voltage triodes and high voltage shield-grid triodes for high voltage switching and/or pulse modulation.
High vacuum, high voltage rectifier tubes.
UHF planar triodes (including miniature types) for CW or pulse applications through 6 Gc and higher, including communications, radar beacon service, and navigation.
Vapor-cooling systems and components for use with Machlett triodes and tetrodes.

CHECK NO.

LITERATURE: General

- 1. Machlett General Catalog
- 2. Machlett Pulse Tubes Brochure
- 3. Machlett CATHODE PRESS

APPLICATION NOTES

UHF PLANAR TRIODES

- 4. General
- 5. Cooling Curves "ML-8500" series
- 6. Articles
- 7. Tube Selection Guide

VAPOR COOLING

- 8. General

VARIABLE VACUUM CAPACITORS

- 9. General

CALCULATION CURVES

- 10. CW Calculation — Cosine Scale, Work Sheet for Calculation, and Descriptive Article.
- 11. SSB Calculation — Descriptive Article (employs Cosine Scale, above, for Calculation).

NAME _____

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NAME _____

TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ **STATE** _____ **ZIP** _____

CW GENERAL POWER OUTPUT LEVELS: CLASS C

Tubes listed are triodes, unless otherwise noted

3 to 4.5 kW

ML-6256 (WC) — **ML-6257** (WC) — **ML-6258** (FAC)

6 to 13 kW

ML-6420 (WC) — **ML-6421** (FAC)

ML-7007 (FAC – tetrode)

12 to 18 kW

ML-6422 (WC) — **ML-6423** (FAC)

ML-8170/4CX5000A (FAC – tetrode) — **ML-8171/4CX10000D** (FAC – tetrode)

24 to 30 kW

ML-6424 (WC) — **ML-6425** (FAC)

30 to 36 kW

ML-8281/4CX15000A (FAC – tetrode)

40 to 50 kW

ML-7479A (VC)

46 to 55 kW

ML-6426 (WC) — **ML-6427** (FAC)

50 to 75 kW

ML-7480A (VC)

72 to 80 kW

ML-6696 (WC) — **ML-6697** (FAC)

50 to 115 kW

ML-5681 (WC)

120 to 175 kW

ML-8317 (FAC)

58 to 215 kW

ML-5682 (WC)

150 to 175 kW

ML-8618 (WC – magnetic beam triode)

250 to 350 kW

ML-8545, ML-8785 (VC) – tetrodes — **ML-8546, ML-8786** (WC – tetrodes)

330 to 440 kW

ML-7482 (VC) — **ML-7560** (WC)

FAC . . . Forced Air Cooled
WC . . . Water Cooled
VC . . . Vapor Cooled

Continuous Wave

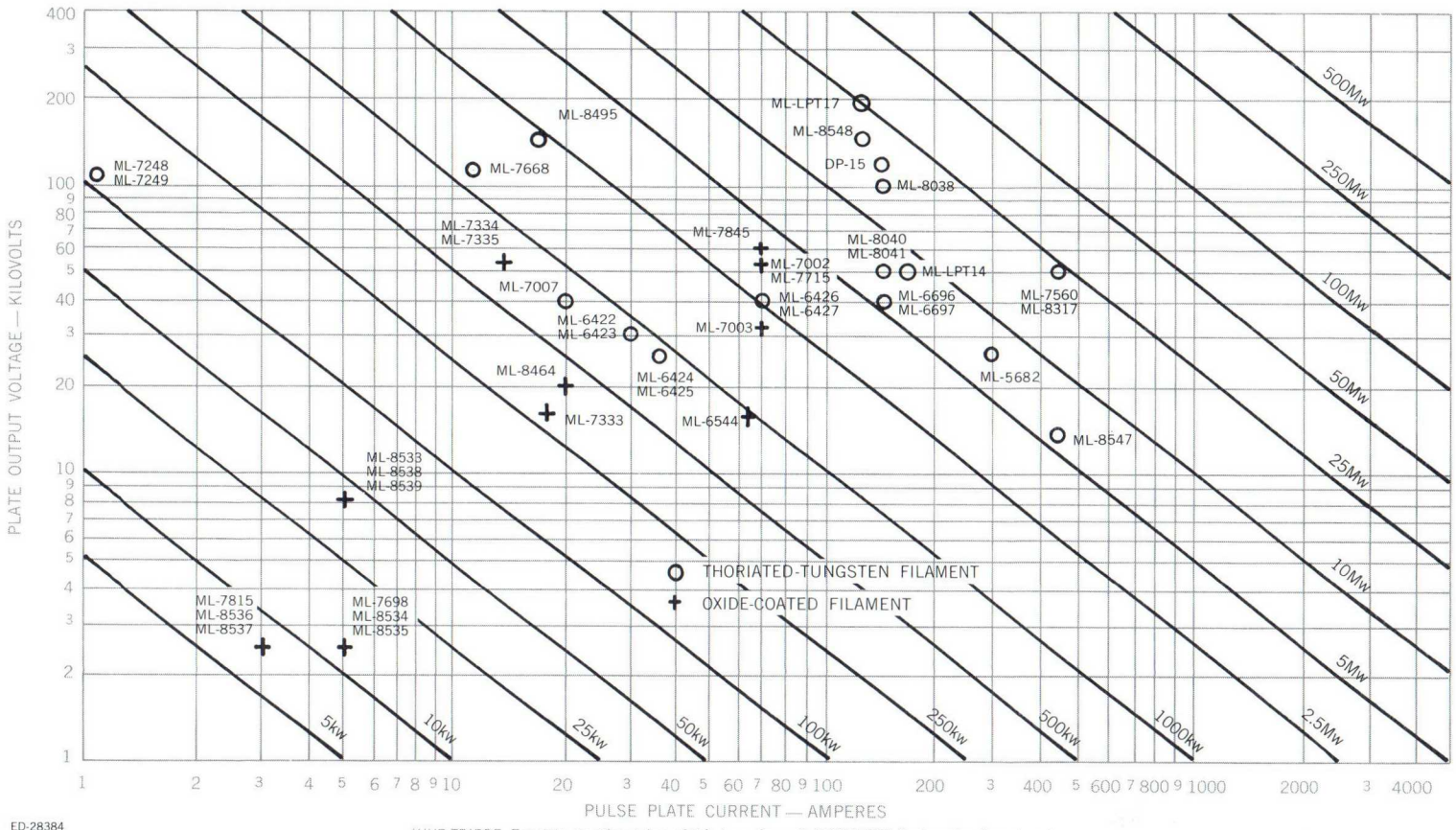
triodes & tetrodes

quick reference

Machlett switching power pulse tubes quick reference

SWITCHING POWER OF MACHLETT PULSE TUBES

Switching power of the current line of Machlett pulse tubes is indicated below. Each tube will deliver output current and voltage approximately up to values indicated by either an O or a +. Lines of constant switching power through these coordinates show the range of current and voltage possible by the use of an output pulse transformer.



ED-28384

*UHF TRIODE. For data on other tubes of this type, Consult MACHLETT Engineering Department

MINIATURE TUBE TYPE	CONVENTIONAL TUBE TYPE	PLATE PULSED		GRID PULSED	
		MAX f	MAX POWER input	MAX f	MAX POWER input
ML-8629* [3, 4]	ML-6442	6Gc+	ML-8629 and ML-8631 3000 v eb 2.8 a ib ML-6442 only 3000 v eb 2.5 a ib	6Gc+	ML-8629 2000 Vdc Eb 2.8 a ib ML-8631 3000 Vdc Eb 2.8 a ib
ML-8631* [3, 4]					
ML-8630 [4]	ML-6771	7Gc+	2500 v eb 1.5 a ib	7Gc+	ML-8630 800 Vdc Eb** 1.5 a ib
ML-8535 [2, 3, 4]	ML-7211 [2]	3Gc+	3500 v eb 5.0 a ib	3Gc+	2500 Vdc Eb 5.0 a ib
ML-8534 [2, 3, 4]	ML-7698 [3]	3Gc+	3500 v eb 5.0 a ib	3Gc+	2500 Vdc Eb 5.0 a ib
ML-8536 [3, 4]	ML-7815 [4]	3Gc+	3500 v eb 3.0 a ib	3Gc+	2500 Vdc Eb 3.0 a ib
ML-8537 [3, 4]	ML-7855 [3, 4]	3Gc+	3500 v eb 3.0 a ib	3Gc+	2500 Vdc Eb 3.0 a ib
ML-8535 [2, 3, 4]	ML-8403 [2, 3, 4]	3Gc+	3500 v eb 5.0 a ib	3Gc+	2500 Vdc Eb 5.0 a ib
ML-8741 [2, 3, 4]	ML-7698 [3]	3Gc+	5000 v eb 5.0 a ib	3Gc+	2500 Vdc Eb 5.0 a ib
ML-8538 [3] ML-8539 [3]	ML-8533 [3]	DC PULSE MODULATOR DC Plate Volts 8 kv	PULSE CATHODE CURRENT 5.0 a ib	3Gc+	8000 Vdc Eb 5.0 a ib

1. 12 second warm-up. 2. High current cathode. 3. Phormat cathode. 4. Frequency stable anode.
*Characteristics similar to ML-6442. **Higher voltage permitted in special circuits.
NOTE: All Machlett miniature planar triodes may be soldered.

	ML-8629	ML-8630	ML-8631
Output capacitance (Cgp):	1.7 pf	1.5 pf	1.3 pf
Weight:	9 grams	9 grams	9 grams
Anode Dissipation:	100 watts	100 watts	100 watts

Ultra planar triodes

High frequency

quick reference

ML-VCV MACHLETT VACUUM CAPACITORS

TYPE DESIGNATIONS	CAPACITY in pF	Volts KV PK	AMP RMS	TYPE DESIGNATIONS	CAPACITY in pF	Volts KV PK	AMP RMS
ML-VCV 1A	5- 750	3	50	ML-VCV 6A	50-2,000	7.5	75
ML-VCV 1B	5- 750	5	50	ML-VCV 6B	50-2,000	10	75
				ML-VCV 6C	50-2,000	12	75
ML-VCV 2A	7-1,000	3	50	ML-VCV 7A	25-1,000	7.5	65
ML-VCV 2B	7-1,000	5	50	ML-VCV 7B	25-1,000	10	65
				ML-VCV 7C	25-1,000	15	65
ML-VCV 3A	10- 750	3	50	ML-VCV 8A	50-2,300	7.5	75
ML-VCV 3B	10- 750	5	50	ML-VCV 8B	50-2,300	10	75
				ML-VCV 8C	50-2,300	15	75
ML-VCV 4A	10-1,000	3	50	ML-VCV 11A	10- 250	5	50
ML-VCV 4B	10-1,000	5	50	ML-VCV 11B	10- 250	7.5	50
ML-VCV 5A	25- 700	7.5	50	ML-VCV 12A	20-1,500	7.5	75
ML-VCV 5B	25- 700	10	50	ML-VCV 12B	20-1,500	10	75
ML-VCV 5C	25- 700	15	50	ML-VCV 12C	20-1,500	15	75

Variable capacitors Vacuum

Large Power Vapor Cooling Systems

quick reference Tubes

50 kW
ML-7479A (vapor-up – triode) .... **page 29**

100 kW
ML-7480A (vapor-up – triode) .... **page 29**

150 kW
ML-7482 (triode)
or (vapor-up) ... **page 29**
ML-8545 (tetrode)

250 kW
ML-7482 (vapor-up – triode) .... **page 29**

50 kW
ML-7479A (vapor-down – triode).. **page 29**

100 kW
ML-7480A (vapor-down – triode).. **page 29**

150 kW
ML-7482 (triode)
• (vapor-down) **page 29**
ML-8545
ML-8785 (tetrodes)

250 kW
ML-7482 (vapor-down – triode).. **page 29**

50 kW
ML-7479A (vapor jacket condenser—triode) ..... **page 29**

100 kW
ML-7480A (vapor jacket condenser—triode) ..... **page 29**

200 kW
ML-7482 (triode)
• (vapor jacket condenser) **page 29**
ML-8545
ML-8785 (tetrodes)

accessories

Accessories are available for all Large Power Tubes and include water jackets (also for use with oil); terminal connectors; air distributors and all components necessary for vapor cooling systems.

For Small Power Tubes (UHF Planar Triodes) accessories are available and include: radiators, heat sinks and water jackets.

literature

CHECK NO. ON CARD

LITERATURE: General

1. Machlett General Catalog
2. Machlett Pulse Tubes Brochure
3. Machlett CATHODE PRESS

APPLICATION NOTES

UHF PLANAR TRIODES

4. General
5. Cooling Curves "ML-8500" series
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10. CW Calculation — Cosine Scale, Work Sheet for Calculation, and Descriptive Article.
11. SSB Calculation — Descriptive Article (employs Cosine Scale, above, for Calculation).

The Machlett large power tube product line now offers high power electron tubes—including triodes and tetrodes — covering a CW power spectrum from 3 kW to 440 kW, and offers pulsed powers to 20 megawatts. Cooling methods available are water and forced-air and vapor-phase. (See page 28, this bulletin, for a description of the many Machlett vapor cooling systems).

• • • •

MAGNETICALLY BEAMED ELECTRON TUBES

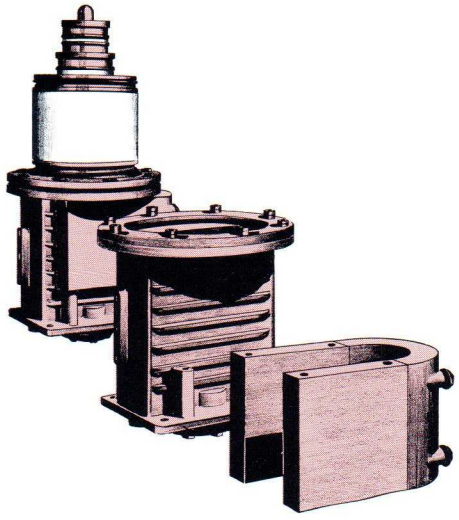
Notable among recent Machlett innovations is the development of magnetically beamed electron tubes. As shown in the table below, the magnetically beamed tube is extremely efficient, requiring 10 to 25 times less lower drive power than a conventional tube of similar output. Magnetic beaming is offered only by Machlett.

By magnetically controlling the trajectory, electrons from the cathode bypass the grid structure so that nearly all emitted electrons reach the anode. . . . Grid current is very low because of a significant reduction in grid interception — about 3% as compared to 25% in conventional triodes. . . . Low grid current means that grid dissipation no longer limits tube power. . . . Parallel plane electrode structure eliminates "shielded" portion of filaments, permits 360° of the cathode surface to face anode surface and complete use is made of the filaments' emission surface — result is higher cathode current per watt of heating power.

	IN PULSE SERVICE		IN RF TELEGRAPHY AMPLIFIER/OSCILLATOR SERVICE	
	ML-8618	Conventional Triode	ML-8618	Conventional Triode
Power Output	6 megawatts	6.5 megawatts	175 kilowatts	175 kilowatts
Driving Power	15 kilowatts	400 kilowatts	0.6 kilowatts	6.0 kilowatts
Filament Power	2.5 kilowatts	5.3 kilowatts	2.5 kilowatts	5.3 kilowatts

RESULT: ML-8618 reduces pulse driving power by a factor of 25 or better.

RESULT: ML-8618 reduces rf driving power by a factor of 10 or better.



general

Large Power Tubes

magnetic beaming

Large Power triodes Tubes

TUBE TYPE	Design Group	Application	Equipment Power Range Class C	Maximum Frequency of Operation for Maximum Ratings
ML-342A Water Cooled	#3	Oscillator, Modulator, Amplifier	10- 30 kW	4 mc/sec.
ML-342AA Forced-Air-Cooled	#3	Oscillator, Modulator, Amplifier	10- 30 kW	4 mc/sec.
ML-356 Water Cooled	#2C	Oscillator, Modulator, Amplifier	30- 50 kW	25 mc/sec.
ML-880 Water Cooled	#2B	Oscillator, Modulator, Amplifier	24- 40 kW	25 mc/sec.
ML-889RA Forced-Air-Cooled	#2A	Oscillator, Modulator, Amplifier	5- 10 kW	40 mc/sec.
ML-891 Water Cooled	#3	Oscillator, Modulator, Amplifier	5- 10 kW	1.6 mc/sec.
ML-891R Forced-Air-Cooled	#3	Oscillator, Modulator, Amplifier	5- 10 kW	1.6 mc/sec.
ML-892 Water Cooled	#3	Oscillator, Modulator, Amplifier	5- 10 kW	1.6 mc/sec.
ML-892R Forced-Air-Cooled	#3	Oscillator, Modulator, Amplifier	5- 10 kW	1.6 mc/sec.
ML-893A Water Cooled	#3	Oscillator, Modulator, Amplifier	30- 50 kW	5 mc/sec.
ML-893AR Forced-Air-Cooled	#3	Oscillator, Modulator, Amplifier	30- 50 kW	5 mc/sec.
ML-5530 Forced-Air-Cooled	#2C	Oscillator, Modulator, Amplifier	4- 6.7 kW	110 mc/sec.
ML-5530H Forced-Air-Cooled	#2C	Oscillator, Modulator, Amplifier	6.7- 7.2 kW	30 mc/sec.
ML-5531 Forced-Air-Cooled	#2C	Oscillator, Modulator, Amplifier	14- 20 kW	30 mc/sec.

***New Equipment design interest**

Design Group	**#1A***	Coaxial terminal triode. Thoriated-tungsten, self-supporting, cathode. Heavy wall anode.
	#1B*	Modified coaxial design. Thoriated-tungsten cathode. Heavy wall anode.
	#1C*	Coaxial terminal triode. Thoriated-tungsten, self-supporting, cathode. Heavy wall vapor-cooled anode.
	#1D*	Same as #1C* except that tube employs ceramic envelope.
Design Group	**#2A**	"Post & dish" terminal triode. Pure tungsten, cathode. Light wall anode.
	#2B	"Post & dish" terminal triode. Pure tungsten, self-supporting, cathode (or variation). Heavy wall anode.
	#2C	"Post & dish" terminal triode. Thoriated-tungsten, self-supporting, cathode. Heavy wall anode.
Design Group	**#3**	Long envelope structure. Pure tungsten cathode. Light wall anode.

FILAMENT Voltage Volts	FILAMENT Current Amps.	Mu	Class of Service	MAXIMUM RATINGS PLATE Voltage Vdc	PLATE Current Adc	GRID Voltage Vdc	GRID Current Adc	PLATE Input Watts	PLATE Dissip. Watts	TUBE TYPE
20.0	67	40	C-T	20000	2.5	—	—	—	25000	**ML-342A** Water Cooled
20.0	67	40	C-T	20000	2.5	—	—	—	5000	**ML-342AA** Forced-Air-Cooled
7.5	170	20	C-T	12500	6	−2000	0.80	60000	22500	**ML-356** Water Cooled
12.6	315	20	C-T	10500	6.0	−1200	0.80	60000	20000	**ML-880** Water Cooled
11.0	120	21	C-T	8500	2.0	−1000	0.25	16000	5000	**ML-889RA** Forced-Air-Cooled
22.0	60	8.5	C-T	12000	2.0	−3000	0.15	18000	6000	**ML-891** Water Cooled
22.0	60	8.5	C-T	10000	2.0	−3000	0.15	15000	4000	**ML-891R** Forced-Air-Cooled
22.0	60	50	C-T	15000	2.0	−3000	0.40	30000	10000	**ML-892** Water Cooled
22.0	60	50	C-T	12500	2.0	−3000	0.40	18000	4000	**ML-892R** Forced-Air-Cooled
20.0	183	34.5	C-T	20000	4.0	−3000	0.40	70000	20000	**ML-893A** Water Cooled
20.0	183	34.5	C-T	20000	4.0	−3000	0.40	70000	20000	**ML-893AR** Forced-Air-Cooled
5.0	55	26	C-T	5000	1.75	−1000	0.20	8750	4000	**ML-5530** Forced-Air-Cooled
5.0	55	26	C-T	8500	1.75	−1000	0.40	10000	4000	**ML-5530H** Forced-Air-Cooled
6.3	92	24	C-T	10500	3.75	−1500	0.6	30000	10000	**ML-5531** Forced-Air-Cooled

C-T: RF Power Amplifier and Oscillator, Class C Telegraphy.

Large *triodes* Power Tubes

Large power triodes

TUBE TYPE	Design Group	Application	Equipment Power Range Class C	Maximum Frequency of Operation for Maximum Ratings
ML-5541 Forced-Air-Cooled	#2C	Oscillator, Modulator, Amplifier	6-11.5 kW	110 mc/sec.
ML-5604 Forced-Air-Cooled	#2B	Oscillator, Modulator, Amplifier	9- 15 kW	25 mc/sec.
ML-5606 Water Cooled	#2A	Oscillator, Modulator, Amplifier	7- 15 kW	1.6 mc/sec.
ML-5619 Water Cooled	#2B	Oscillator, Modulator, Amplifier	9- 22 kW	25 mc/sec.
ML-5658 Water Cooled	#2B	Oscillator, Modulator, Amplifier	17- 38 kW	15 mc/sec.
ML-5666 Water Cooled	#2B	Oscillator, Modulator, Amplifier	6- 12 kW	22.5 mc/sec.
ML-5667 Forced-Air-Cooled	#2B	Oscillator, Modulator, Amplifier	6- 12 kW	22.5 mc/sec.
ML-5668 Water Cooled	#2B	Oscillator, Modulator, Amplifier	8- 17 kW	5 mc/sec.
ML-5669 Forced-Air-Cooled	#2B	Oscillator, Modulator, Amplifier	8- 17 kW	5 mc/sec.
ML-5681* Water Cooled	#1A	Oscillator, Modulator, Amplifier	52-115 kW	30 mc/sec.
ML-5682*▲ Water Cooled	#1A	Oscillator, Modulator, Amplifier	58-215 kW	30 mc/sec.
ML-6256* Water Cooled	#1B	Oscillator, Modulator, Amplifier	3- 4.5 kW	40 mc/sec.
ML-6257* Water Cooled	#1B	Oscillator, Modulator, Amplifier	3- 4.5 kW	40 mc/sec.
ML-6258* Forced-Air-Cooled	#1B	Oscillator, Modulator, Amplifier	3- 4.5 kW	40 mc/sec.
ML-6420* Water Cooled	#1A	Oscillator, Modulator, Amplifier	6- 13 kW	30 mc/sec.
ML-6421* Forced-Air-Cooled	#1A	Oscillator, Modulator, Amplifier	6- 13 kW	30 mc/sec.
ML-6421-F Forced-Air-Cooled	#1B	Oscillator, Modulator, Amplifier	6- 13 kW	30 mc/sec.

▲Also available with a ceramic envelope, designated ML-5682K.
For other symbol legends, see Pages 6 and 7.

FILAMENT Voltage Volts	FILAMENT Current Amps.	Mu	Class of Service	MAXIMUM RATINGS PLATE Voltage Vdc	PLATE Current Adc	GRID Voltage Vdc	GRID Current Adc	PLATE Watts Input	PLATE Dissip. Watts	TUBE TYPE
7.5	57	26	C-T	8500	2.75	−1500	0.30	23000	10000	**ML-5541** Forced-Air-Cooled
11.0	176	20	C-T	12500	3.0	−2000	0.45	32500	10000	**ML-5604** Forced-Air-Cooled
22.0	60	50	C-T	14000	2.0	−1600	0.40	25000	10000	**ML-5606** Water Cooled
11.0	176	20	C-T	12500	3.0	−2000	0.45	32500	20000	**ML-5619** Water Cooled
12.0	310	20	C-T	12500	6.0	−1600	0.80	60000	20000	**ML-5658** Water Cooled
11.0	120	21	C-T	10000	2.0	−1500	0.35	20000	12500	**ML-5666** Water Cooled
11.0	120	21	C-T	10000	2.0	−1500	0.35	20000	7500	**ML-5667** Forced-Air-Cooled
22.0	60	50	C-T	14000	2.0	−1600	0.40	28000	20000	**ML-5668** Water Cooled
22.0	60	50	C-T	14000	2.0	−1600	0.40	28000	10000	**ML-5669** Forced-Air-Cooled
12.0	220	25	C-T 110 mcs/sec.	15000 9000	12 12	−3200 −3200	2.0 2.0	150000 90000	75000 75000	**ML-5681*** Water Cooled
16.5	325	30	C-T 88 mcs/sec.	16000 9000	20 20	−3200 −3200	4.0 2.5	300000 170000	120000 120000	**ML-5682*▲** Water Cooled
12.6	29	20	C-T	6000	1.5	−1500	0.22	7000	5000	**ML-6256*** Water Cooled
12.6	29	20	C-T	6000	1.5	−1500	0.22	7000	5000	**ML-6257*** Water Cooled
12.6	29	20	C-T	6000	1.5	−1500	0.22	7000	3000	**ML-6258*** Forced-Air-Cooled
7.0	85	20	C-T	10000	2.2	−1600	0.42	20000	12500	**ML-6420*** Water Cooled
7.0	85	20	C-T	10000	2.2	−1600	0.42	20000	10000	**ML-6421*** Forced-Air-Cooled
7.0	85	20	C-T	10000	2.2	−1600	0.42	20000	7500	**ML-6421-F** Forced-Air-Cooled

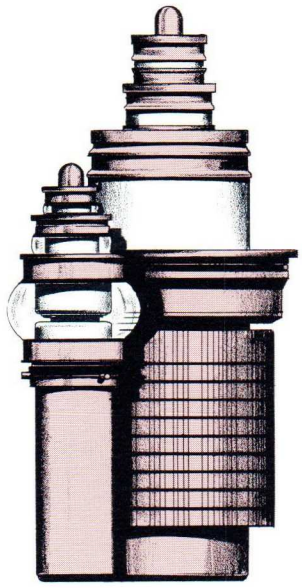
Large *triodes* Power Tubes

TUBE TYPE	Design Group	Application	Equipment Power Range Class C	Maximum Frequency of Operation for Maximum Ratings
ML-6422* Water Cooled	#1A	Oscillator, Modulator, Amplifier	12-18 kW	30 mc/sec.
ML-6423* Forced-Air-Cooled	#1A	Oscillator, Modulator, Amplifier	12-18 kW	30 mc/sec.
ML-6423-F Forced-Air-Cooled	#1B	Oscillator, Modulator, Amplifier	12-18 kW	30 mc/sec.
ML-6424* Water Cooled	#1A	Oscillator, Modulator, Amplifier	24-30 kW	30 mc/sec.
ML-6425* Forced-Air-Cooled	#1A	Oscillator, Modulator, Amplifier	24-30 kW	30 mc/sec.
ML-6425-F Forced-Air-Cooled	#1B	Oscillator, Modulator, Amplifier	24-30 kW	30 mc/sec.
ML-6426* Water Cooled	#1A	Oscillator, Modulator, Amplifier	46-55 kW	30 mc/sec.
ML-6427* Forced-Air-Cooled	#1A	Oscillator, Modulator, Amplifier	46-48 kW	30 mc/sec.
ML-6576 Water Cooled	#2C	Oscillator, Modulator, Amplifier	36 kW	25 mc/sec.
ML-6696*▲ Water Cooled	#1A	Oscillator, Modulator, Amplifier	72-80 kW	30 mc/sec.
ML-6697*▲† Forced-Air-Cooled	#1A	Oscillator, Modulator, Amplifier	72-80 kW	30 mc/sec.
ML-7479A* Vapor Cooled	#1C	Oscillator, Modulator, Amplifier	—	30 mc/sec.
ML-7480A* Vapor Cooled	#1C	Oscillator, Modulator, Amplifier	—	30 mc/sec.

▲Also available with ceramic envelope, order ML-6696A or ML-6697A.
For other symbol legends, see Pages 6 and 7.

†A version of the ML-6697 with ruggedized grid is available; order ML-466R. Similarly a ruggedized grid version of the ML-6697A is available; order ML-466RA.

FILAMENT Voltage Volts	FILAMENT Current Amps.	Mu	Class of Service	MAXIMUM RATINGS PLATE Voltage Vdc	PLATE Current Adc	GRID Voltage Vdc	GRID Current Adc	PLATE Input Watts	PLATE Dissip. Watts	TUBE TYPE
7.0	85	90	C-T	12500	2.5	−1400	0.50	30000	20000	**ML-6422*** Water Cooled
7.0	85	90	C-T	12500	2.5	−1400	0.50	30000	12500	**ML-6423*** Forced-Air-Cooled
7.0	85	90	C-T	12500	2.5	−1400	0.50	30000	10000	**ML-6423-F** Forced-Air-Cooled
7.0	120	20	C-T	12500	3.5	−2000	0.50	40000	20000	**ML-6424*** Water Cooled
7.0	120	20	C-T	12500	3.5	−2000	0.50	40000	12500	**ML-6425*** Forced-Air-Cooled
7.0	120	20	C-T	12500	3.5	−2000	0.50	40000	10000	**ML-6425-F** Forced-Air-Cooled
8.0	200	20	C-T	12500	8.0	−2000	1.0	80000	40000	**ML-6426*** Water Cooled
8.0	200	20	C-T	12500	8.0	−2000	1.0	80000	20000	**ML-6427*** Forced-Air-Cooled
7.5	170	5.5	C-T SSB	10000 12000	6.0 5.0	−2400 —	0.20 —	60000 45000	22500 22500	**ML-6576** Water Cooled
13.0	205	20	C-T	16000	11	−3200	2.0	120000	60000	**ML-6696*▲** Water Cooled
13.0	205	20	C-T	16000	11	−3200	2.0	120000	35000	**ML-6697*▲†** Forced-Air-Cooled
8.0	200	20	CT	12500	8	−2000	1.0	90000	50000	**ML-7479A*** Vapor Cooled
13.0	205	20	CT	150000	11	−3200	2.0	150000	80000	**ML-7480A*** Vapor Cooled



Large *triodes* Power Tubes

Large Power Tubes

triodes

TUBE TYPE	Design Group	Application	Equipment Power Range Class C	Maximum Frequency of Operation for Maximum Ratings
ML-7482* ♣ Vapor Cooled Ceramic	#1C	Oscillator, Modulator, Amplifier	330-440 kW	30 mc/sec.
ML-7560* ♣ Water Cooled Ceramic	#1A	Oscillator, Modulator, Amplifier	330-440 kW	30 mc/sec.
ML-8317* ♣ Forced-Air-Cooled Ceramic	#1A	Oscillator, Modulator, Amplifier	175 kW	30 mc/sec.
ML-8547* Water-Cooled	#1D	Oscillator, Modulator, Amplifier	190 kW	30 mc/sec.
ML-8618* Water-Cooled	#1D	Magnetic Beam — High Gain Triode Oscillator, Modulator, Amplifier	175 kW	30 mc/sec.

tetrodes

TUBE TYPE	Application	Power Range Class C	Maximum Frequency for Full Power Operation
ML-7007* Forced-Air-Cooled	VHF Television Service	6- 10 kW	220 mc/sec.
ML-8170/ 4CX5000A* ▲ Forced-Air-Cooled	Oscillator, Amplifier, Modulator	16 kW	30 mc/sec. 110 mc/sec. †
ML-8171/ 4CX10000D* Forced-Air-Cooled	Oscillator, Amplifier, Modulator	16 kW	30 mc/sec. 110 mc/sec. †
ML-8281/ 4CX15000A* Forced-Air-Cooled	Oscillator, Amplifier, Modulator	36 kW	30 mc/sec. 110 mc/sec. †
ML-8545* Vapor-Cooled	Oscillator, Amplifier, Modulator	330 kW	50 mc/sec.
ML-8546* Water-Cooled	Oscillator, Amplifier, Modulator	330 kW	50 mc/sec.
ML-8661/ 4CW10000A* Water-Cooled	Oscillator, Amplifier, Modulator	16 kW	30 mc/sec. 110 mc/sec. †
ML-8785* Vapor-Cooled	Oscillator, Amplifier, Modulator	350 kW	50 mc/sec.
ML-8786* Water-Cooled	Oscillator, Amplifier, Modulator	350 kW	50 mc/sec.

UHF tetrode

ML-4CPX250K* Forced-Air-Cooled	Pulsed Modulator, long-pulse, screen-grid modulation	Typical Peak Power 10 kw Reduced Ratings to	400 mc/sec. 1200 mc/sec.

***New Equipment design interest.**

▲Also available in ruggedized version as ML-8170W/4CX5000R.
For other symbol legends, see Pages 6 and 7.

♣Also available with Vac-ion pump. ♣Supplied with Vac-ion pump.

†At slightly reduced power.

Large Power Tubes

triodes

FILAMENT Voltage Volts	FILAMENT Current Amps	Mu	Class of Service	MAXIMUM RATINGS PLATE Voltage Vdc	PLATE Current Adc	GRID Voltage Vdc	GRID Current Adc	PLATE Input Watts	PLATE Dissip. Watts	TUBE TYPE
14.5	450	45	CT	20000	30	−1500	4.0	600000	200000	**ML-7482*** ♣ Vapor Cooled Ceramic
14.5	450	45	CT	20000	30	−1500	4.0	600000	175000	**ML-7560*** ♣ Water Cooled Ceramic
14.5	450	45	CT	20000	20	−1500	3.0	250000	60000	**ML-8317*** ♣ Forced-Air-Cooled Ceramic
14.5	450	14	C-T	11000	30	−3500	—	—	175000	**ML-8547*** Water-Cooled
7.5	320	25	C-T	17000	20	−4000	—	—	80000	**ML-8618*** Water-Cooled

tetrodes

FILAMENT Voltage Volts	FILAMENT Current Amps	Mu	Class of Service	PLATE Voltage Vdc	PLATE Current Adc	MAXIMUM RATINGS SCREEN GRID Voltage Vdc	CONTROL GRID Voltage Vdc	PLATE Input Watts	PLATE Dissip. Watts	TUBE TYPE
5.0	180	10	B	7500	4.0	2000	−155	24000	12000	**ML-7007*** Forced-Air-Cooled
7.5	75	4.5	C-T	7500	3	1500	−600	22000	5000	**ML-8170/ 4CX5000A*** ▲ Forced-Air-Cooled
7.5	75	4.5	C-T	7500	3	1500	−600	22000	10000	**ML-8171/ 4CX10000D*** Forced-Air-Cooled
6.3	160	4.5	C-T	10000	5	2000	−800	50000	15000	**ML-8281/ 4CX15000A*** Forced-Air-Cooled
12	400	5	C-T	18000	25	2500	−1500	450000	150000	**ML-8545*** Vapor-Cooled
12	400	5	C-T	18000	25	2500	−1500	450000	150000	**ML-8546*** Water-Cooled
7.5	75	4.5	C-T	7500	3	1500	−600	22000	12000	**ML-8661/ 4CW10000A*** Water-Cooled
15	400	5	C-T	18000	25	2500	−1500	450000	175000	**ML-8785*** Vapor-Cooled
15	400	5	C-T	18000	25	2500	−1500	450000	175000	**ML-8786*** Water-Cooled

UHF tetrode

FILAMENT Voltage Volts	FILAMENT Current Amps	Mu	Class of Service	PLATE Voltage Vdc	PLATE Current Adc	SCREEN GRID Voltage Vdc	CONTROL GRID Voltage Vdc	Pulse Duration μsec.	Duty	TUBE TYPE
6.0	2.7	5.2	Grid-Pulsed	5500	6	1000	−250	250	.005	**ML-4CPX250K*** Forced-Air-Cooled
			Plate-Pulsed	7000	6	1000	−250	250	.005	

C-T: RF Power Amplifier and Oscillator, Class C Telegraphy.

SSB: RF Power Amplifier and Oscillator, Class C Telegraphy.

B: RF Power Amplifier, Class B Television Service

Large pulse modulator Power Tubes

general

MAGNETICALLY BEAMED TUBES FOR PULSE MODULATION

The extremely low drive requirements for magnetically beamed tubes is no where better shown than in their application for switching and modulator service — as indicated in the example below.

PULSE MODULATOR OR PULSE AMPLIFIER: When used as a switch tube in hard tube modulators for radar, particle accelerators or similar applications, the ML-8618 may be operated to 50 kVdc, with a pulse output of more than 8 Mw, and 16 kW drive for a power gain of 500. Pulse widths of 10 milliseconds and a duty factor of .06 are permissible.

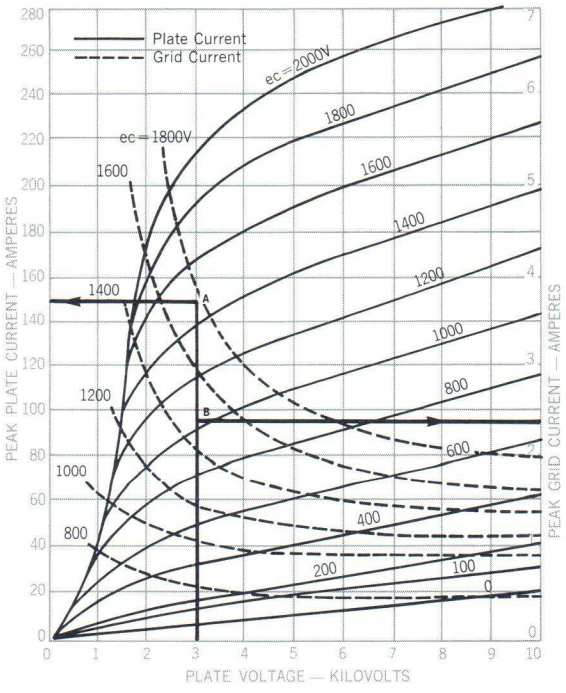
Using the constant grid voltage characteristics shown in Figure 1, points "A" and "B", typical pulse modulator, give a switching power of about 7 Mw at .06 duty as shown below:

Plate Voltage	E_{bb}	= 50 kV
Plate Drop	e_b	= 3 kV
Load Voltage	e_L	= 47 kV
Plate Current	i_b	= 150 amps
Cut-Off Voltage	$-E_c$	= 4000 volts
Positive Grid Drive Voltage	e_{gk}	= 1500 volts
Grid Current	i_c	= 2.4 amps
Power Output	P_o	$= i_b \times e_L = 7.05$ Mw
Plate Dissipation	P_A	$= i_b \times e_b \times$ duty = 27 kW
Peak Grid Drive Power	P_{gr}	$= i_c \times (e_{gk} \; E_c) = 13.2$ kW
Grid Dissipation	P_g	$= i_c \times e_{gk} \times$ duty = 216 watts
Switch Efficiency	$P_o{}^i / P_i$	= 94 percent
Power Gain		= 7.05 Mw/13.2 kW = 500

For these conditions, the tube may be operated in air or other dielectric medium; pulse length of 10 milliseconds permissible, for a maximum duty factor of 6% (.06).

At nominal filament voltage, $E_f = 7.5$ volts, the maximum pulse current, which may be obtained from the cathode of the ML-8618 tube is about 200 amperes, with a cathode life expectancy of more than 10,000 hours. For more cathode current, the filament voltage may be increased by 5% to 10% to provide cathode currents of about 250 to 300 amperes. Under such conditions the cathode life still will be several thousands of hours.

In any pulse modulator application, observance of maximum tube ratings is required. One should allow for possible circuit transient conditions and their energy peaks, to guarantee that the maximum tube ratings are not exceeded. The use of fast-acting crowbar circuits, which will remove energy from a flash arcing tube to a shunting circuit is positively required.



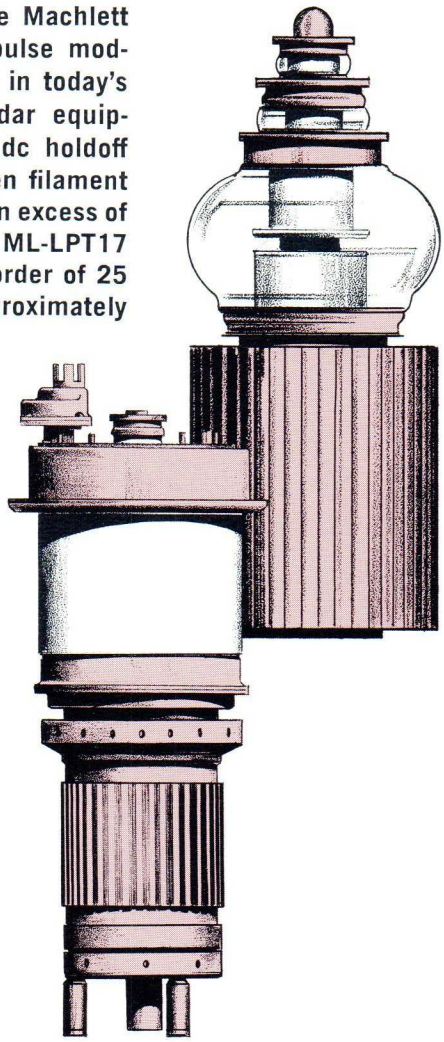
HIGH VOLTAGE, HIGH POWER SWITCH TUBES

The commercial market contains a number of power tubes capable of emission in the order of hundreds of amperes. In the development of new tubes for pulse generator service, therefore, most of the emphasis at Machlett has been on designs for higher voltage. Operation of tubes in parallel, moreover, has been generally more satisfactory than series stacking, so there has been more incentive to work towards higher holdoff voltage capability in a single device.

• • • •

One example of these new tubes is the ML-8040, a high-voltage high-mu triode designed primarily to operate as a switch tube in hard-tube pulse modulators, for radar and similar applications. In this service it can deliver pulse output in the order of 20 Mw with plate voltage up to 125kV.

The ML-LPT17 is a further extension in the Machlett development of high voltage, high power pulse modulator tubes for use as switching elements in today's and tomorrow's long-range, high-power radar equipment. This tube is rated for operation at dc holdoff voltages up to 200 kV. Its thoriated tungsten filament has been conservatively designed to provide in excess of 225 amperes of pulse cathode current. The ML-LPT17 is capable of switching pulse power in the order of 25 megawatts at a plate voltage efficiency of approximately 90%, and with less than 60 amperes of pulse drive current. The anode is capable of dissipating in excess of 30 kW when cooled with a moderate flow of oil; grid dissipation capabilities exceed typical drive circuit requirements. The tube is designed for operation in insulating oil or an equivalent dielectric gas.



Large pulse modulator Power Tubes

general

Large pulse modulator Power Tubes

TUBE TYPE	Design Group	Application	Typical Pulse Power
ML-6544* Forced-Air-Cooled	#1A	Shielded Grid Triode for Pulse Generation	Typical Pulse Output 1 Mw
ML-7002* Liquid Cooled **ML-7715*** Forced-Air-Cooled	#1A	Shielded Grid Triode for Pulse Generation	Typical Pulse Output 3.5 Mw
ML-7003* Forced-Air-Cooled	#1A	Shielded Grid Triode for Pulse Generation	Typical Pulse Output 2.5 Mw
ML-7248* Radiation Cooled	#2	Tetrode for Pulse Generation (Oil insulated)	Typical Pulse Output 0.15 Mw
ML-7249* Radiation and Forced-Air-Cooled	#2	Tetrode for Pulse Generation	Typical Pulse Output 0.15 Mw
ML-7560* ♣ Water Cooled **ML-8547*** Water Cooled	#1D	Triode for Pulse Generation (ML-7560 — Very high peak current, very high average power) (ML-8547 — Same peak current and high power at lower plate kv)	Typical Pulse Output 15 Mw
ML-7668* Oil Convection Cooled	#1E	Triode for Pulse Generation (Oil insulated)	Typical Pulse Output 1.75 Mw
ML-7845* Forced-Air-Cooled	#1A	Shielded Grid Triode for Pulse Generation	Typical Pulse Output 4.5 Mw
ML-8038* Liquid Cooled	#1B	Triode for Pulse Generation (Oil Insulated)	Typical Pulse Output 15 Mw
ML-8040* Forced-Air-Cooled **ML-8041*** Water Cooled	#1B	Triode for Pulse Generation	Typical Pulse Output 5 Mw
ML-8317* ♣ Forced-Air-Cooled	#1D	Triode for Pulse Generation (Very high peak current, very high average power)	Typical Pulse Output 15 Mw
ML-8495* Forced-Air-Cooled	#1B	Triode for Pulse Generation (For very high voltage operation)	Typical Pulse Output 3 Mw
ML-8618* Water Cooled	#1D	Magnetic Beam Triode (Very low drive for full output)	Typical Pulse Output 8 Mw
ML-DP15* Oil-Cooled	Coaxial Triode	High Mu Triode for Pulse Generation	Typical Pulse Output 20 Mw
ML-LPT17* ♣ Oil-Cooled	#1D	Triode for Pulse Generation (Very high power. Extremely high voltage)	Typical Pulse Output 20 Mw
ML-8772* Water-Cooled **ML-8773*** Forced-Air-Cooled	#1E	Triode for Pulse Generation	Typical Pulse Output 4.5 Mw
TETRODE FOR PULSE MODULATION		**ML-7007:** .8 Mw	at 24 kV

***New Equipment design interest.**

Design Group #1A* Shielded Grid Triode. Unipotential oxide cathode; external anode. Beamed electrode design; shield grid protects cathode from arcs; stable operation at high voltage. High mu and low grid current provide low drive.
Design Group #1B* Similar to 1A; employs internal anode.
Design Group #1C* Similar to 1A; ceramic envelope.
Design Group #1D* Coaxial terminal triode; ceramic envelope.
Design Group #1E* Internal anode triode; thoriated-tungsten filament.
Design Group #2* Internal anode tetrode.

♣Also available with Vac-ion pump. ♣Supplied with Vac-ion pump.

Large pulse modulator Power Tubes

FILAMENT		MAXIMUM RATINGS PLATE				GRID		These ratings are not necessarily simultaneous			TUBE TYPE
Voltage Volts	Current Amps.	Voltage Vdc	Voltage Peak - kv	Current mAdc	Current Peak† Amps.	Voltage Volts	Voltage Peak positive Volts	Pulse Duration	Duty Factor	Plate Dissipation	
6.0	60	20000	25	250	75	−600	1500	6 μsec.	0.03	1 kW	**ML-6544*** Forced-Air-Cooled
6.0	60	65000	70	250	90	−600	1500	25 μsec.	0.03	3 kW	**ML-7002*** **ML-7715***
6.0	60	45000	50	250	90	−600	1500	25 μsec.	0.03	3 kW	**ML-7003*** Forced-Air-Cooled
6.3	11.7	—	125	—	2.0	−420	350 (1000‡)	Millisecond Range	—§	0.2 kW	**ML-7248*** Radiation Cooled
6.3	11.7	— —	125 (oil ins.) 65 (air ins.)	— —	2.0	−420	350 (1000‡)	Millisecond Range	—§	0.5 kW (oil) 0.3 kW (air)	**ML-7249*** Radiation and Forced-Air-Cooled
14.5▲	450	ML-7560 50000 ML-8547 17000	55 19	—	550	−3500	—	1000 μsec.	0.01	175 kW	**ML-7650*** ♣ **ML-8547***
12.6	29	150▲	160▲	—	15	−1500	1000	Millisecond Range	—§	0.75 kW	**ML-7668*** Oil Convection Cooled
6.0	60	75000	80	250	90	−600	—	25 μsec.	0.03	3 kW	**ML-7845*** Forced-Air-Cooled
13.0	205	125000	125	—	175	−1500	—	1000 μsec.	0.01	5 kW	**ML-8038*** Liquid Cooled
13.0	205	60000	65	—	175	−1500	—	1000 μsec.	0.01	10 kW 60 kW	**ML-8040*** **ML-8041***
14.5▲	450	50000	55	—	550	−3500	—	1000 μsec.	0.01	60 kW	**ML-8317*** ♣ Forced-Air-Cooled
12.6	29	160	165	—	22	−1000	—	1000 μsec.	0.008	2.5 kW	**ML-8495*** Forced-Air-Cooled
7.5	320	45000	50	—	200	−15000	2500	10000 μsec.	0.06	80 kW	**ML-8618*** Water Cooled
13	210	150000	150	—	175	−1500	2200	1000 μsec.	0.01	1 kW	**ML-DP15*** Oil-Cooled
11.0	350	200000	200	—	225	−1500	2500	1000 μsec.	0.005	30 kW	**ML-LPT17*** ♣ Oil-Cooled
13.0	205	40000	45	—	175	−7500	—	1000 μsec.	.01	60 kW ML-8772 35 kW ML-8773	**ML-8772*** **ML-8773***

ML-8546: 10 Mw at 40 kV **TETRODE FOR PULSE MODULATION**

†Pulse cathode current
‡Maximum screen voltage
§Depends on mode of operation
▲For operation at voltages above 125 pkv, consult the Machlett Engineering Department.
^For cathode currents over 350 amps; filament voltage must be 15.0 volts.

For more information, write for brochure, "Machlett Hard Pulse Modulator Tubes".

Ultra planar triodes High Frequency general

UHF PLANAR TRIODES — For DME, Transponders, Collision Avoidance Systems, Radar Altimeters, TACAN, Communications.

Machlett miniature planar triodes (ML-8534 through ML-8539: ML-8629 through ML-8631: & ML-8741) offer the same unique performance characteristics as the Machlett standard planar tubes. Highest activity cathodes (the Phormat cathode), with frequency stable design, permit grid pulsed operation. This is significant because these Machlett tubes are the first and only planar tubes rated for this difficult mode . . . one which allows unusual simplicity and flexibility in circuit design together with equipment size reduction.

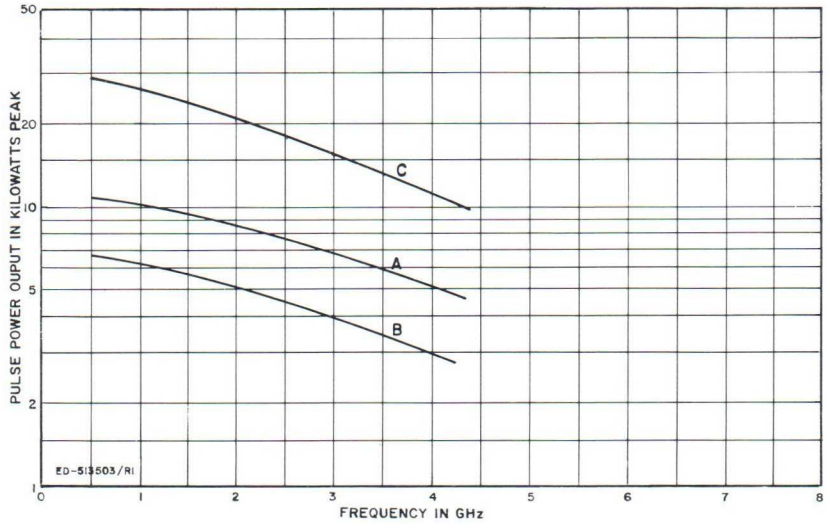
MINIATURE PLANAR TRIODES

Pulse Power Output vs. Frequency — Plate Pulsed

A: ML-8403, ML-8534, ML-8535

B: ML-7855, ML-8536, ML-8537

C: ML-8533, ML-8538, ML-8539

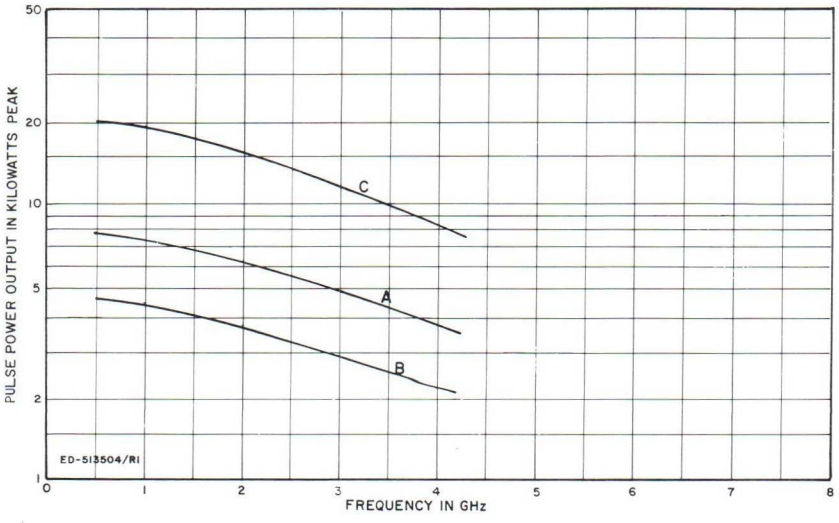


Pulse Power Output vs. Frequency — Grid Pulsed

A: ML-8403, ML-8534, ML-8535

B: ML-7855, ML-8536, ML-8537

C: ML-8533, ML-8538, ML-8539



PHORMAT CATHODE: High voltage stability for grid or plate pulsed applications. Phormat (matrix) cathodes have been tested to 12,000 volts and more. Used in planar triodes ML-7211, ML-7698, ML-7815, ML-8403, ML-8533, ML-8745, and except ML-8630, all miniature planar triodes including ML-8741.

FREQUENCY STABLE ANODE: Unique anode design allows frequency stable operation within 10-15 seconds after application of high voltage, plus these advantages:

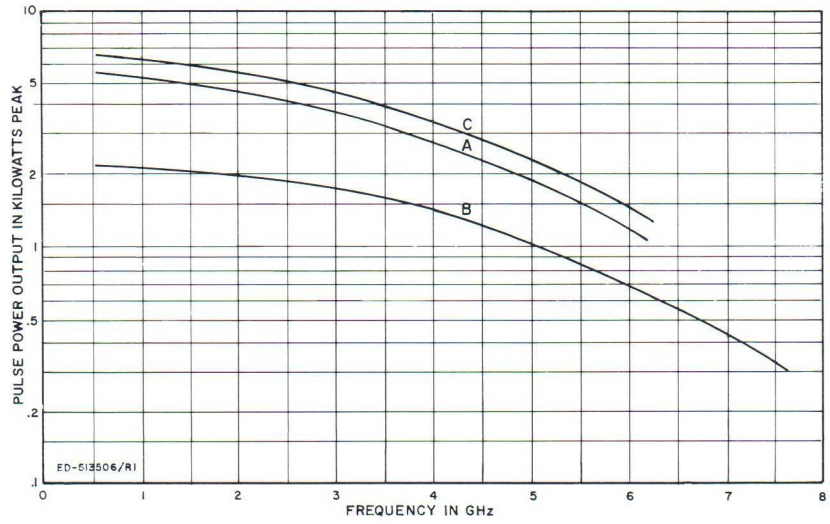
1. Frequency shift during initial tune-up less than 1 Mc.
2. Does not require regulated plate supply, since change of anode dissipation does not affect frequency.
3. Permits variable duty cycle without noticeable shift in frequency.

Used in planar triodes ML-7855, ML-8403, and miniature planar triodes, ML-8534, ML-8535, ML-8536, ML-8537, ML-8629, ML-8630, and ML-8631.

HIGH CATHODE CURRENT: 50% more cathode current (190 vs. 125ma) permits power to 110 watts CW. Used in planar triodes ML-7211, ML-8403 and miniature planar triodes, ML-8534, ML-8535, and ML-8741.

MINIATURE PLANAR TRIODES

Pulse Power Output vs. Frequency — Plate Pulsed

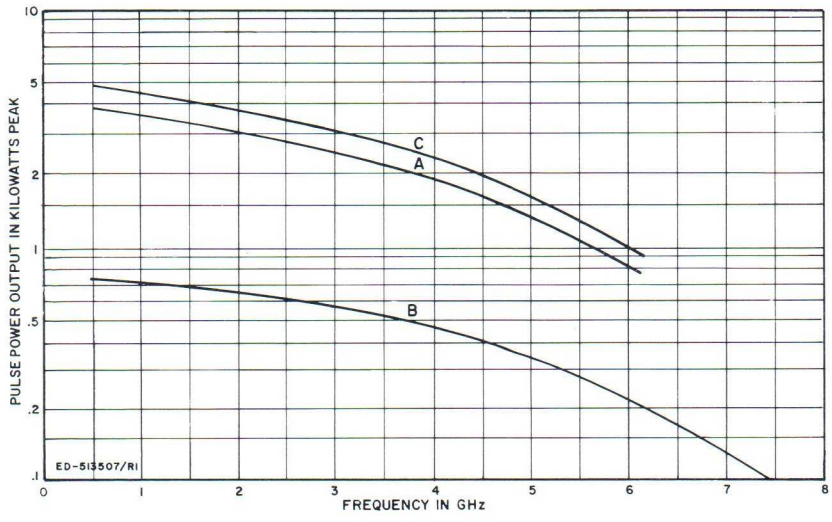


A: ML-8629

B: ML-8630

C: ML-8631

Pulse Power Output vs. Frequency — Grid Pulsed



A: ML-8629

B: ML-8630

C: ML-8631

Ultra *planar* High *triodes* Frequency *general*

Ultra planar triodes

High Frequency

TUBE TYPE	Design Group	UHF Application	Maximum Frequency of Operation for Full Ratings
ML-2C39A Forced-Air-Cooled	#3	Oscillator, Amplifier, Frequency Multiplier	2500 mc/sec.
ML-2C39WA Forced-Air-Cooled	#2	Oscillator, Amplifier, Frequency Multiplier	2500 mc/sec.
ML-2C41 Forced-Air-Cooled	#3	Plate-pulsed Oscillator, Amplifier	3000 mc/sec.
ML-6442* Conduction Convection Cooled	#1	Plate-pulsed Oscillator, Amplifier, Frequency Multiplier Oscillator, Amplifier, Frequency Multiplier	5000 mc/sec. 2500 mc/sec.
ML-6771* Conduction/Convection Cooled	#1	Plate-pulsed Oscillator, Amplifier, Frequency Multiplier Oscillator, Amplifier, Frequency Multiplier	6000 mc/sec. 4000 mc/sec.
ML-7209 Forced-Air-Cooled	#2	Plate-pulsed Oscillator, Amplifier, Frequency Multiplier (High shock ratings)	3000 mc sec.
ML-7210* Forced-Air-Cooled	#2	Plate-pulsed Oscillator, Amplifier, Frequency Multiplier Oscillator, Amplifier, Frequency Multiplier (12 second warm-up cathode)	3000 mc sec. 2500 mc sec.
ML-7211* Forced-Air-Cooled	#1	Oscillator, Amplifier, Frequency Multiplier (High cathode current capability)	2500 mc sec.
ML-7289/3CX100A5* Forced-Air-Cooled	#1	Oscillator, Amplifier, Frequency Multiplier	2500 mc sec.
ML-7698*▲ Conduction/Convection Cooled	#1	Plate or Grid-pulsed Oscillator, Amplifier, Frequency Multiplier (High cathode current capability)	3000 mc sec.
ML-7815/3CPN10A5* Conduction/Convection Cooled	#1	Plate Pulsed Oscillator and Amplifier Grid Pulsed Oscillator and Amplifier CW Oscillator and Amplifier	3000 mc/sec. 3000 mc/sec. 2500 mc/sec.
ML-7855* Forced-Air-Cooled	#1	Oscillator, Amplifier, Frequency Multiplier (Frequency stable anode)	2500 mc sec.
ML-8403* Forced-Air-Cooled	#1	Plate Pulsed Oscillator and Amplifier Grid Pulsed Oscillator and Amplifier CW Oscillator and Amplifier	3000 mc/sec. 3000 mc/sec. 2500 mc/sec.
ML-8533* Forced-Air-Cooled	#1	Plate or Grid-Pulsed Oscillator, Amplifier, Frequency Multiplier, Modulator (As Modulator peak pulse in order of 20kW has been obtained at .001 duty)	3000 mc/sec
Miniature **ML-8534*** Conduction/Convection/ Cooled	#1	Plate Pulsed Oscillator and Amplifier Grid Pulsed Oscillator and Amplifier CW Oscillator and Amplifier	3000 mc/sec. 3000 mc/sec. 2500 mc/sec.
Miniature **ML-8535*** Forced-Air-Cooled	#1	Plate Pulsed Oscillator and Amplifier Grid Pulsed Oscillator and Amplifier CW Oscillator and Amplifier	3000 mc/sec. 3000 mc/sec. 2500 mc/sec.
Miniature **ML-8536*** Conduction/Convection/ Cooled	#1	Plate Pulsed Oscillator and Amplifier Grid Pulsed Oscillator and Amplifier CW Oscillator and Amplifier	3000 mc/sec. 3000 mc/sec. 2500 mc/sec.
Miniature **ML-8537*** Forced-Air-Cooled	#1	Plate Pulsed Oscillator and Amplifier Grid Pulsed Oscillator and Amplifier CW Oscillator and Amplifier	3000 mc/sec. 3000 mc/sec. 2500 mc/sec.
Miniature **ML-8538*** Conduction/Convection/ Cooled	#1	Plate or Grid Pulsed Oscillator, Amplifier Switch Tube; Frequency Multiplier	3000 mc/sec.

***New Equipment design interest.**

Design Group #1 Ceramic envelope; coaxial terminals; ruggedized planar electrodes; tightly held concentricity tolerances; exacting production specifications. Low interelectrode capacitance; low lead inductance; close production and testing control of cathode activity.

Design Group #2 Similar to Group #1 except for use of glass envelope.

Design Group #3 Glass envelope; coaxial terminals; planar electrodes. Low interelectrode capacitance; low lead inductance.

FILAMENT Voltage Volts	FILAMENT Current Amps.	Mu	Sm	Duty	MAXIMUM RATINGS PLATE Volts	PLATE Current Amps.	GRID Voltage Volts	GRID Current Amps.	Average Plate Dissipation Watts	TUBE TYPE
6.3	1.0	100	24000	CW	1000	0.1	−150	0.050	100	**ML-2C39A** Forced-Air-Cooled
6.0	1.0	100	25000	CW	1000	0.1	−150	0.050	100	**ML-2C39WA** Forced-Air-Cooled
6.3	1.03	100	25000	0.0025	3500‡	4.0§	−150	2.5§	35	**ML-2C41** Forced-Air-Cooled
6.3	0.90	50	16500	0.001 CW	3000‡ 350	2.5§ .035	−100 − 50	1.25§ .015	7.5 8	**ML-6442*** Conduction/Convection Cooled
6.3	0.57	90	23000	0.001 CW	2000 300	1.25 0.025	−25 −25	0.50 0.008	3 6.25	**ML-6771*** Conduction/Convection Cooled
6.0	1.0	100	25000	.0033	3500‡	3.0§	−150	1.5§	35	**ML-7209** Forced-Air-Cooled
6.3	0.85	75	17000	CW 0.0025	1000 3500‡	.075 2.8§	−150 −150	0.030 1.2§	100 25	**ML-7210*** Forced-Air-Cooled
6.3	1.3	80	30000	CW	1000	0.15	−150	0.045	100	**ML-7211*** Forced-Air-Cooled
6.0	1.0	100	25000	CW	1000	0.1	−150	0.050	100	**ML-7289/3CX100A5*** Forced-Air-Cooled
6.3	1.3	80	30000	0.0033	3500‡ 2000 (grid pulsed)	5.0§	−150	2.5§	10†	**ML-7698*▲** Conduction/Convection Cooled
6.0	1.0	100	25000	.0033 .0033 CW	3500 2000 2000	3.0§ 4.8§ 0.1	−150	1.8 1.8§ 0.050	10†▲	**ML-7815/3CPN10A5*** Conduction/Convection Cooled
6.0	1.0	80	25000	CW	1000	0.125	−150	0.030	100	**ML-7855*** Forced-Air-Cooled
6.0	1.25	80	30000	.0033 .0033 CW	3500 2000 2000	5.0§ 5.0§ .15	−150	2.5§ 2.5§ .045	58 33 100	**ML-8403*** Forced-Air-Cooled
6.3	1.3	90	30000	Pulse Modulator	10000§	5.0§	−150	—	100	**ML-8533*** Forced-Air-Cooled
6.3	1.30	80	38000	.0033 .0033 CW	3500 2500 2500	5.0§ 5.0§ .25	−150	2.0 2.0 .045	10 10 10	Miniature **ML-8534*** Conduction/Convection/ Cooled
6.3	1.30	80	38000	.0033 .0033 CW	3500 2500 2500	5.0§ 5.0§ .25	−150	2.0 2.0 .045	60 60 150	Miniature **ML-8535*** Forced-Air-Cooled
6.0	1.0	80	30000	.0033 .0033 CW	3500 2500 2500	3.0§ 3.0§ .15	−150	1.2 1.2 .045	10 10 10	Miniature **ML-8536*** Conduction/Convection/ Cooled
6.0	1.0	80	30000	.0033 .0033 CW	3500 2500 2500	3.0§ 3.0§ .15	−150	1.2 1.2 .045	35 35 150	Miniature **ML-8537*** Forced-Air-Cooled
6.3	1.3	90 Cutoff 145 Dynamic	30000	Pulse Modulator	8000 10000§	5.0§	−150	2.0	10	Miniature **ML-8538*** Conduction/Convection/ Cooled

†Greater anode dissipation may be achieved with Conduction —.and/or Forced-Air-Cooling.
‡Plate pulsed
§Peak
▲Plate dissipation up to 100 watts is obtainable on tube furnished with radiator (ML-7815R) and appropriate forced-air cooling.

NOTE: Water Jackets are available for ML-8534 through ML-8539.

Ultra planar triodes High Frequency

Ultra planar High triodes

Frequency high vacuum diodes

TUBE TYPE	Design Group	UHF Application	Maximum Frequency of Operation for Full Ratings
Miniature **ML-8539*** Forced-Air-Cooled	#1	Plate or Grid Pulsed Oscillator, Amplifier Switch Tube; Frequency Multiplier	3000 mc/sec.
Miniature **ML-8629*** Conduction/Convection/ Ccoled	#1	Plate Pulsed, Grid Pulsed or CW Oscillator, Amplifier, Frequency Multiplier	5000 mc/sec.
Miniature **ML-8630*** Conduction/Convection/ Cooled	#1	Plate Pulsed, Grid Pulsed or CW Oscillator, Amplifier, Frequency Multiplier	6000 mc/sec.
Miniature **ML-8631*** Conduction/Convection/ Cooled	#1	Plate Pulsed, Grid Pulsed or CW Oscillator, Amplifier, Frequency Multiplier	5000 mc/sec.
Miniature **ML-8741*** Conduction/Convection/ Cooled	#1	Plate Pulsed Oscillator and Amplifier Grid Pulsed Oscillator and Amplifier CW Oscillator and Amplifier	3000 mc/sec. 3000 mc/sec. 2500 mc/sec.
Miniature **ML-8745*** Forced-Air-Cooled	#1	Grid Pulsed Oscillator and Amplifier CW Oscillator and Amplifier	3000 mc/sec. 2500 mc/sec.

***New Equipment design interest.**

Design Group #1 Ceramic envelope; coaxial terminals; ruggedized planar electrodes; tightly held concentricity tolerances; exacting production specification. Low interelectrode capacitance; low lead inductance; close production and testing control of cathode activity.

			GENERAL CHARACTERISTICS		
			FILAMENT		
TUBE TYPE	Design Group	Application	Insulating Medium	Voltage Volts	Approx. Current Amps.
ML-102A* Radiation Cooled	#1A	Electrostatic Particle Precipitation Service	Air	20	19
ML-141* Radiation and Forced-Air-Cooled	#1A	Electrostatic Particle Precipitation Service	Air or Oil	5.5	6.5
ML-142* Radiation Cooled	#1A	Compact High Voltage Applications	Air or Oil	3.8	6.6
ML-5575/100* Radiation Cooled	#1A	Electrostatic Particle Precipitation Service	Air	20	24
ML-5576/200* Radiation Cooled	#1A	Electrostatic Particle Precipitation Service	Air	20	32
ML-6908* External Anode/ Convection Cooled	#1B	High Power High Voltage Supplies Hold-off Diode Service in Radar Application	Oil	12	23
ML-8094/199* Radiation Cooled	#1A	Electrostatic Particle Precipitation Service Hold-off Diode Service in Radar Application	Air	12	23
ML-8224* Radiation Cooled	#1C	Voltage Multiplier & Energy Storage Circuit Requiring High Peak Power	Air or Oil	5.5	6.5
ML-XRT-1	#1A	High Voltage Power Supplies	Oil	6.0	6.8

***New Equipment design interest.**

Design Group
- #1A* Glass envelope; internal anode. Self-shielding catenary type filament.
- #1B* Glass envelope; external anode. Self-shielding catenary type filament.
- #1C* Glass envelope; internal anode.

FILAMENT Voltage Volts	FILAMENT Current Amps.	Mu	Sm	Duty	MAXIMUM RATINGS PLATE Volts	PLATE Current Amps.	GRID Voltage Volts	GRID Current Amps.	Average Plate Dissipation Watts	TUBE TYPE
6.3	1.3	90 Cutoff 145 Dynamic	30000	Pulse Modulator	5000 10000§	5.0§	−150	2.0	100	Miniature **ML-8539*** Forced-Air-Cooled
6.3	.85	90	31000	.0025	3000	3.0§	−100	1.3	100 with heat sink	Miniature **ML-8629*** Conduction/Convection/ Cooled
6.3	.57	90	33000	.001	2500	1.5§	−50	.6	50 with heat sink	Miniature **ML-8630*** Conduction/Convection/ Cooled
6.3	.85	145	30000	.0025	3000	3.0§	−100	1.3	100 with heat sink	Miniature **ML-8631*** Conduction/Convection/ Cooled
6.3	1.30	80	38000	.0033 .0033 CW	3500	5.0§ 5.0§ .25	−150	2.0 2.0 .045	10 10 10	Miniature **ML-8741*** Conduction/Convection/ Cooled
6.0	1.0	100	25000	.0033 CW	2000 2000	4.8§ 0.1	−150	1.8§ 0.50	100 100	Miniature **ML-8745*** Forced-Air-Cooled

NOTE: Data for the tetrode ML-4CPX250K will be found on pages 12 and 13.

NOTE: The UHF PJanar Diode ML-322 is available for service, typically as modulation clipper, to 800v peak inverse, at 0.60 amps.

ANODE Peak Inverse Anode Voltage PKV	Peak Anode Current Amps.	MAXIMUM RATINGS Circuit	Load Current Rating Unfiltered† Amps.	Filtered‡ Amps.	TUBE TYPE
75	0.75	Single-phase, Four-Tube, Full Wave	0.48	0.75	**ML-102A*** Radiation Cooled
		Three-phase, Full-Wave	0.72	0.75	
80 (Air Insulation) 125 (Oil Insulation)	0.75	Single-phase, Four-Tube, Full Wave	0.40	0.47	**ML-141*** Radiation and Forced-Air-Cooled
		Three-phase, Full-Wave	0.60	0.60	
50 (Air Insulation) 100 (Oil Insulation)	0.30	Single-phase, Four-Tube, Full Wave	0.15	0.20	**ML-142*** Radiation Cooled
		Three-phase, Full-Wave	0.225	0.225	
150	1.0	Single-phase, Four-Tube, Full Wave	0.64	1.0	**ML-5575/100*** Radiation Cooled
		Three-phase, Full-Wave	0.96	1.0	
150	2.5	Single-phase, Four-Tube, Full Wave	1.59	2.50	**ML-5576/200*** Radiation Cooled
		Three-phase, Full-Wave	2.40	2.50	
150▲	10.0	Single-phase, Four-Tube, Full Wave	3.20	3.50	**ML-6908*** External Anode/ Convection Cooled
		Three-phase, Full-Wave	4.40	4.50	
110	10.0	Single-phase, Four-Tube, Full Wave	2.60	2.90	**ML-8094/199*** Radiation Cooled
		Three-phase, Full-Wave	3.50	3.60	
80 (Air Insulation) 150 (Oil Insulation)	0.75	Single-phase, Four-Tube, Full Wave	.270	.250	**ML-8224*** Radiation Cooled
		Three-phase, Full-Wave	.375	.375	
165	1.0	Single-phase, Four-Tube, Full Wave	.36	.39	**ML-XRT-1**
		Three-phase, Full-Wave	.54	.54	

†Unfiltered Load Current Ratings are based on sine-wave voltage input and resistance load without inductive or capacitive effects.

‡Filtered Load Current Ratings are based on sine-wave voltage input and infinite inductance choke input filter.

Ultra planar High triodes Frequency high vacuum diodes

Vacuum Capacitors Variable

general

HIGH-PRECISION, LOW TORQUE, VACUUM VARIABLE CAPACITORS FOR HEAVY DUTY

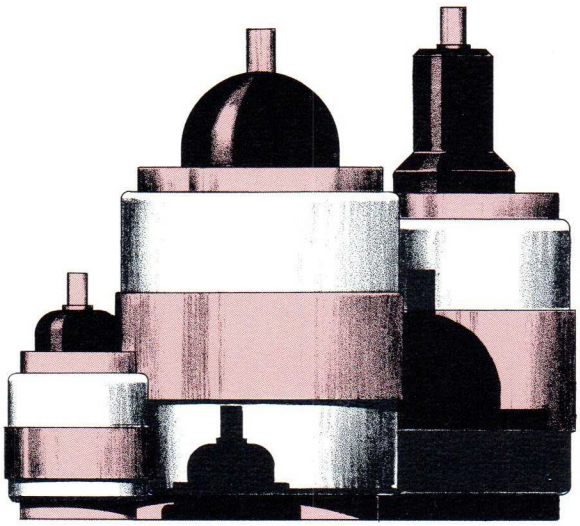
Each of the ceramic vacuum variable capacitors from Machlett offers the following advantages:

- High rf current capability
- Stable operation at high temperature
- Structural rigidity
- Low capacitance variation with temperature change

VACUUM VARIABLE CAPACITORS — GENERAL

RATINGS

Ratings are given to limit capacitor voltage, current and temperature in order to assure long life. No one of the three ratings should be exceeded at any time. It usually will not be possible to operate the capacitor with all three parameters at their maximum rated values simultaneously.



VOLTAGE RATING

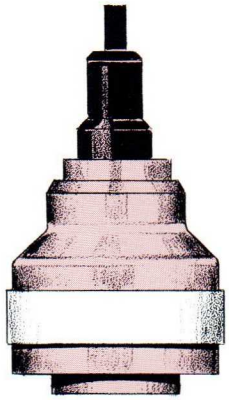
The peak voltage rating of the capacitor is based on 60 cps operation and the maximum capacitance value. It applies to momentary or transient operation as well as steady-state operation. With the plates disengaged, at lowest capacitance values, Machlett variable capacitors will withstand voltages several times higher than the rated voltage. At high frequencies and high values of capacitance, the capacitive reactance will be low, and the current or temperature rating will limit operation before the maximum rated voltage can be obtained.

- Wide capacitance range
- High Q factor (1000 or greater)
- Low operating torque
- High resistance to damage from over-voltage

Capacitance values from 5-750 pF to 50-2300 pF; voltage rating to 15 kv; current rating to 75A. Custom design consultation for special applications is available from Machlett.

CURRENT RATING — GENERAL

The current rating is the root-mean-square value during steady state operation. The capacitor is capable of withstanding momentary current loads much in excess of the stated value provided that the voltage rating is not exceeded. For specific momentary current ratings, consult the Machlett Laboratories giving details concerning duty. At low frequencies and low values of capacitance, the capacitive reactance will be high, and the maximum voltage rating might limit operation before the maximum current rating can be achieved.



TEMPERATURE RATINGS AND COOLING

The maximum permissible operating temperature of the envelope is generally 100°C. Higher temperatures are feasible for special applications. For radio-frequency operation, the voltage and/or current must be limited to such values that the recommended maximum temperature is not exceeded. Ratings are based on the type of cooling specified for the capacitors. Where capacitors are natural-convection-cooled, an increase in current ratings may be achieved by using forced-air cooling. Capacitors can also be designed for water cooling, in which case current ratings can be increased several times. Use of the mounting structure as a heat sink can appreciably reduce operating temperature. Forced-air, when used for cooling, should be reasonably well distributed over the capacitor envelope.

Vacuum capacitors

Capacitors

Variable

ELECTRICAL					MECHANICAL
Tube Type	Capacitance Range pf	Peak Voltage Rating (60 cps, 750 pf) kv	Current Ratings A	Envelope Insulator	Cooling
ML-VCV 1A ML-VCV 1B	5-750	3 5	50	ceramic	natural convection
ML-VCV 2A ML-VCV 2B	7-1000	3 5	50	ceramic	natural convection
ML-VCV 3A ML-VCV 3B	10-750	3 5	50	ceramic	natural convection
ML-VCV 4A ML-VCV 4B	10-1000	3 5	50	ceramic	natural convection
ML-VCV 5A ML-VCV 5B ML-VCV 5C	25-700	7.5 10 15	50	ceramic	natural convection
ML-VCV 6A ML-VCV 6B ML-VCV 6C	50-2000	7.5 10 12	75	ceramic	natural convection
ML-VCV 7A ML-VCV 7B ML-VCV 7C	25-1000	7.5 10 15	65	ceramic	natural convection
ML-VCV 8A ML-VCV 8B ML-VCV 8C	50-2300	7.5 10 15	75	ceramic	natural convection
ML-VCV 11A ML-VCV 11B	10-250	5 7.5	50	ceramic	natural convection
ML-VCV 12A ML-VCV 12B ML-VCV 12C	20-1500	7.5 10 15	75	ceramic	natural convection

All ML-VCV units are of New Equipment design interest.

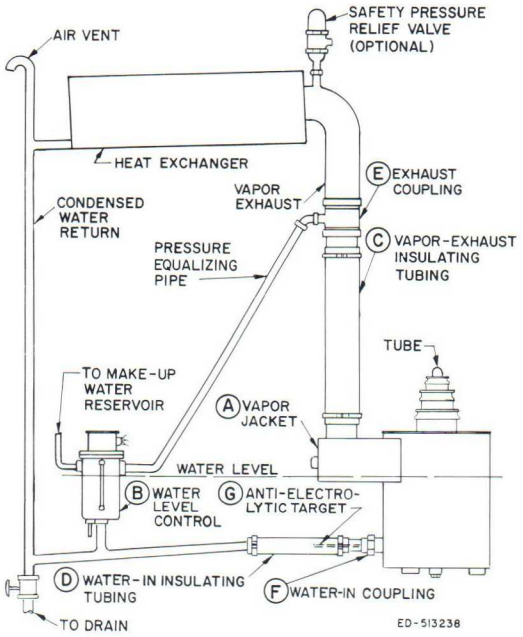
Maximum Envelope Temp. °C	Adjustment Shaft turns min. to max. capacitance	Rotation to decrease cap.	Torque max. in-oz.	Torque typical in-oz.	weight lb.	Tube Type
100	25	clockwise	40	10-20	3.1	ML-VCV 1A ML-VCV 1B
100	25	clockwise	40	10-20	3	ML-VCV 2A ML-VCV 2B
100	22	clockwise	50	15-30	3.2	ML-VCV 3A ML-VCV 3B
100	17	clockwise	50	15-30	3.2	ML-VCV 4A ML-VCV 4B
100	25	clockwise	50	15-30	6.5	ML-VCV 5A ML-VCV 5B ML-VCV 5C
100	34	clockwise	50	15-30	10	ML-VCV 6A ML-VCV 6B ML-VCV 6C
100	27	clockwise	50	15-30	—	ML-VCV 7A ML-VCV 7B ML-VCV 7C
100	38	clockwise	50	15-30	—	ML-VCV 8A ML-VCV 8B ML-VCV 8C
100	18	clockwise	50	15-30	3	ML-VCV 11A ML-VCV 11B
100	31	clockwise	50	15-42	7.5	ML-VCV 12A ML-VCV 12B ML-VCV 12C

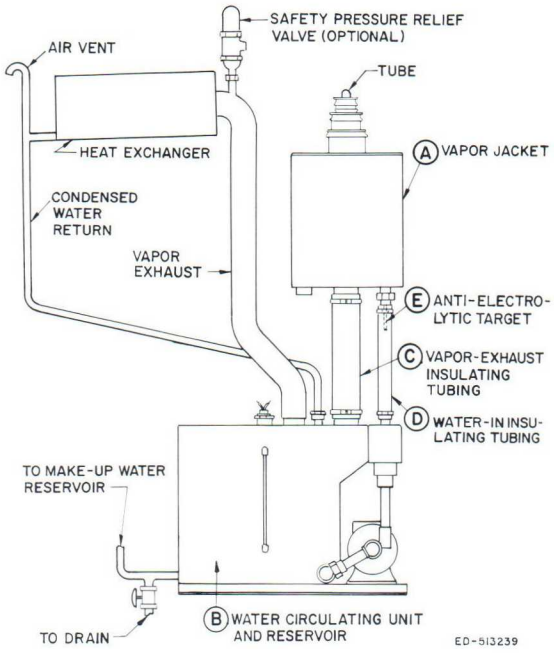
Vapor Cooling Systems

general

Following are the important advantages of vapor cooling systems:

- Low Cost—initial equipment investment and operating maintenance cost are low.
- Anode dissipation is 300 to 400% higher than comparable forced-air and 10-20% higher than comparable water-cooled systems.
- Operation is quiet — absence of objectionable noise levels is psychological advantage—allowing personnel to function more effectively.
- System has safe, simple design, operating at atmospheric pressure, without high pressure pumps or blowers—has short insulated connections.
- Adaptable to certain types of remote operation—does not require close supervision.
- Tube life is maximized by purity of coolant which minimizes scale formation on anode.
- Tube removal for inspection may be accomplished without draining or closing off cooling systems.
- Heat removed from forced-air or water-cooled heat exchangers may be used for heating—particularly important for remotely located transmitter sites.
- Distilled water production—as many as several hundred quarts of distilled water per day—may be efficiently removed from a vapor cooled system, with a small added expense for additional components.





VAPOR UP SYSTEM

Tube Type	Part No.	Description	No. Req'd.
50 KW ML-7479A	F-27893	VAPOR JACKET	1
	F-27888	WATER LEVEL CONTROL	1
	F-27887	VAPOR EXHAUST INSULATING TUBING	1
	F-27884	WATER-IN INSULATING TUBING	1
	F-27880	EXHAUST COUPLING	1
	F-27877	WATER-IN COUPLING	1
	F-27882	ANTI-ELECTROLYTIC TARGET	1
100 KW ML-7480A	F-27889	VAPOR JACKET	1
	F510336	WATER LEVEL CONTROL	1
	F-27886	VAPOR EXHAUST INSULATING TUBING	1
	F513091	WATER-IN INSULATING TUBING	1
	F-27879	EXHAUST COUPLING	1
	F-27877	WATER-IN COUPLING	1
	F-27882	ANTI-ELECTROLYTIC TARGET	1
150 KW ML-7482 ML-8545	F-27899	VAPOR JACKET	1
	F-510336	WATER LEVEL CONTROL	1
	F-27885	VAPOR EXHAUST INSULATING TUBING	1
	F513092	WATER-IN INSULATING TUBING	1
	F-27878	EXHAUST COUPLING	1
	F-27877	WATER-IN COUPLING	1
	F-27882	ANTI-ELECTROLYTIC TARGET	1
250 KW* ML-7482	F-27890	VAPOR JACKET	1
	F513248	WATER LEVEL CONTROL	1
	F-510337	VAPOR EXHAUST INSULATING TUBING	1
	F-27883	WATER-IN INSULATING TUBING	1
	F-510338	EXHAUST COUPLING	1
	F-27876	WATER-IN COUPLING	1
	F-27881	ANTI-ELECTROLYTIC TARGET	1

VAPOR DOWN SYSTEM

50 KW ML-7479A	F-28901	VAPOR JACKET	1
	F-28694	WATER CIRC. UNIT AND RESERVOIR	1
	F512518	VAPOR EXHAUST INSULATING TUBING	1
	F-27884	WATER-IN INSULATING TUBING	1
	F-27882	ANTI-ELECTROLYTIC TARGET	1
100 KW ML-7480A	F-27891	VAPOR JACKET	1
	F-28694	WATER CIRC. UNIT AND RESERVOIR	1
	F-27886	VAPOR EXHAUST INSULATING TUBING	1
	F-513091	WATER-IN INSULATING TUBING	1
	F-27882	ANTI-ELECTROLYTIC TARGET	1
150 KW ML-7482 ML-8545	F-28903	VAPOR JACKET	1
	F-28692	WATER CIRC. UNIT AND RESERVOIR	1
	F-27885	VAPOR EXHAUST INSULATING TUBING	1
	F513092	WATER-IN INSULATING TUBING	1
	F-27882	ANTI-ELECTROLYTIC TARGET	1
250 KW* ML-7482	F-28905	VAPOR JACKET DESIGN NOT COMPLETED	1
	F-28692	WATER CIRC. UNIT AND RESERVOIR	1
	F-510337	VAPOR EXHAUST INSULATING TUBING	1
	F-27883	WATER-IN INSULATING TUBING	1
	F-27881	ANTI-ELECTROLYTIC TARGET	1

VAPOR JACKET CONDENSER UNITS

50 KW ML-7479A	F-27872	VAPOR JACKET CONDENSER UNIT (Complete)	1
100 KW ML-7480A	F-27871	VAPOR JACKET CONDENSER UNIT (Complete)	1
200 KW ML-7482 ML-8545	F-27870	VAPOR JACKET CONDENSER UNIT (Complete)	1

*Contact Machlett Sales Department.

Vapor Cooling Systems

vapor-up systems

vapor-down systems

TRIODE & TETRODE ACCESSORIES†

Machlett Tube Type	Description	No. Req'd.	Part No.
	CONNECTORS		
356-880 889RA - 5604 - 5606 5619 - 5658 - 5666 5667 - 5668 - 5669	FILAMENT CONNECTOR with STRAPS	2	F12167
	FILAMENT CONNECTOR without STRAPS	2	F13220
	GRID CONNECTOR with JUMPER & STRAPS	1	F8540
	GRID CONNECTOR with JUMPER without STRAPS	1	F13221
5681 - 5682 5682K	FILAMENT CONNECTOR (small)	1	F12589
	FILAMENT CONNECTOR (large)	1	F12590
	GRID and ANODE CONNECTOR	1 ea.	F12591
5530 - 5530H - 5531 5541	FILAMENT or GRID CONNECTOR	3, 2 Fil. 1 Grid	P14988
6256 - 6257 6258 - 7668	FILAMENT CONNECTOR (small)	1	F14383
	FILAMENT CONNECTOR (large)	1	F14382
	GRID CONNECTOR††	1	F14381
6420 - 6421 - 6421F 6422 - 6423 - 6423F 6424 - 6425 - 6425F 6426 - 6427	FILAMENT CONNECTOR (small)	1	F17487
	FILAMENT CONNECTOR (large)	1	F17488
	GRID CONNECTOR	1	F17489
6696 - 6696A 6697 - 6697A 7479A - 7480A 8038 - 8040 - 8041	FILAMENT CONNECTOR (small)†	1	F17488
	FILAMENT CONNECTOR (large)	1	F17489
	GRID CONNECTOR	1	F17397
6544 - 7002 - 7003	HEATER CONNECTOR	1	F21989
	CATHODE CONNECTOR	1	F21991
	GRID CONNECTOR	1	F21987
7482 - 7560 8317 - 7482V 7560V - 8317V - 8618	FILAMENT CONNECTOR (small)	1	F27218
	FILAMENT CONNECTOR (large)	1	F27219
	GRID CONNECTOR	1	F27220
8545 - 8546	FILAMENT (small)	1	P510187
	FILAMENT (large)	1	P510188
	CONTROL GRID	1	P510206
	SCREEN GRID	1	F27220
	WATER JACKETS		
356 - 880 - 5658 6576	WATER JACKET with "O" RING GASKET	1	F10690
	"O" RING GASKET	1	P8645
5619 - 6422 - 6424	WATER JACKET with "O" RING GASKET	1	F7963
5666 - 6420	WATER JACKET with "O" RING GASKET	1	F8529
5668	WATER JACKET with "O" RING GASKET	1	F8528
5619 - 5666 - 5668 6420 - 6422 - 6424	"O" RING GASKET	1	P7976
	MOUNTING CLAMP for WATER JACKET	1	F8768
	MOUNTING PLATE for WATER JACKET	1	F8772
6256	"O" RING GASKET	1	P14384
6426	WATER JACKET with "O" RING GASKET	1	F17292
	"O" RING GASKET	1	P17494

†Accessories for the ML-466R and ML-466RA are identical to those for the ML-6697.
††This grid connector is for the ML-6256, 6257, 6258 only.

TRIODE & TETRODE ACCESSORIES

Machlett Tube Type	Description	No. Req'd.	Part No.
6426 - 6696 - 6696A	MOUNTING CLAMP for WATER JACKET (1 if mounted on plate) (2 if mounted on side)	1, 2	P15198
	MOUNTING PLATE for WATER JACKET	1	F15196
6696 - 6696A	WATER JACKET with "O" RING GASKET	1	F17393
	"O" RING GASKET	1	P17494
8041	WATER JACKET with "O" RING GASKET	1	F26720
	MOUNTING PLATE for WATER JACKET	1	F26731
	CLAMP RING for WATER JACKET	1	P26730
	AIR DISTRIBUTORS		
6421	AIR DISTRIBUTOR (Including 3 P21113 Clips)	1	F17796
6423 - 6425	AIR DISTRIBUTOR (Including 3 P21113 Clips)	1	F17797
6427	AIR DISTRIBUTOR (Including 3 P21113 Clips)	1	F17798
6697 - 6697A	AIR DISTRIBUTOR (Including 3 P21113 Clips)	1	F17759
8317 - 8317V	AIR DISTRIBUTOR (Including 3 P27837 Clips)	1	F27836
	TUBE SUPPORTS		
6258	GLASS INSULATED TUBE SUPPORT	1	P21186
891R - 892R - 889RA 5604 - 5667 - 5669 6421F - 6423F - 6425F	TUBE SUPPORT	1	P27453
5530 - 5530H - 6544	TUBE SUPPORT	1	P16891
5531 - 5541 7003 - 7715	TUBE SUPPORT	1	P16893
6421 - 6423 - 6425	TUBE SUPPORT	1	F17794
6427 - 6697 - 6697A	TUBE SUPPORT	1	F17795
8317 - 8317V	TUBE SUPPORT	1	F27814
	MOUNTING SOCKETS		
5681 - 5682 5682K	MOUNTING SOCKET	1	F12527
	"O" RING GASKET for SOCKET	1	P13745
	INNER GASKET for SOCKET	1	P12272
102A - 141 - 5575/100 5576/200 - 8094/199 8224	MOUNTING SOCKET	1	P8835
8170/4CX5000A 8170W/4CX5000R 8171/4CX10000D 8281/4CX15000A 8661/4CW10000A	MOUNTING SOCKET	1	P511451
8170/4CX5000A 8170W/4CX5000R	CHIMNEY	1	P510382
8171/4CX10000D	CHIMNEY	1	P512410
8281/4CX15000A	CHIMNEY	1	P511450

ACCESSORIES FOR MAGNETIC BEAM TRIODES

Machlett Tube Type	Description	No. Req'd	Part No.
8618	FILAMENT CONNECTOR (small)	1	F27218
	FILAMENT CONNECTOR (large)	1	F27219
	GRID CONNECTOR	1	F27220
	WATER JACKET with "O" RING GASKET	1	F512759
	MAGNET	1	P511165
	"O" RING GASKET for WATER JACKET	1	P512372

ACCESSORIES FOR PLANAR TRIODES

7209 - 7211 - 7289 - 7815R 7855 - 7698R - 8403 - 8533 2C39A - 2C39WA - 3CX100A5	TUBE PULLER*	
8534 - 8535 - 8536 8537 - 8538 - 8539	TUBE PULLER	S20508
8629 - 8630 - 8631	TUBE PULLER	S20509
7209 - 7289 - 7698 - 7815 7855 - 8403 - 8533 2C39A - 2C39WA 3CX100A5	WATER JACKET	S20367
8534 - 8536 - 8538	WATER JACKET	S20999
8629 - 8630 - 8631	WATER JACKET	S20992
• • •	PIN TYPE RADIATOR**	P-511952

ACCESSORIES FOR OIL OPERATION

Machlett Tube Type	Description	No. Req'd	Part No.
8495 8548	OIL JACKET	1	F27548
	OIL JACKET SLEEVE	1	510264
	OIL JACKET BAYONET BASE	1	510268
	FILAMENT CONNECTOR	2	510657
	GRID CONNECTOR	1	510658

MISCELLANEOUS ACCESSORIES

"O" RING GASKET	TUBE SILICONE GREASE	2 oz.	RM6388
AIR DISTRIBUTOR	SPRING LOCKING CLIPS	3	P21113
7560 - 7560V	COUPLING PLUG for WATER JACKET	2	P25795
6697 - 6697A	LIFTING HANDLE		S16840

FLAT GASKETS FOR WATER JACKETS

Machlett Tube Type	Req'd Quant.	Part No.	Suggested Users Net	Mfrs. Net	Machlett Tube Type	Req'd. Quant.	Part No.
ML-298A	4	P9675	$ .50	$ .25	ML-891	1	P4599
ML-342A	1	P9569	.50	.25	ML-892	1	P4599
	1	P9709			ML-893A	1	P5962
ML-880	1	P4619	1.50	1.00	ML-5606	1	P4599
					ML-5658	1	P4619

*Fits most planar triode radiators

**Available for all planar triodes. Must be ordered with tube.

image intensifier tubes

Tube Type	Fiber Optics Useful Diameter	Cascaded Stages	Grounded Electrode	Photocathode	Phosphor
ML-8857	18 mm	1	Either	S-20*	P-20
ML-8858	18 mm	3	Cathode	S-20*	P-20
ML-8585	25 mm	1	Either	S-20*	P-20
ML-8586	25 mm	3	Cathode	S-20*	P-20
ML-8788	25 mm	3	Anode	S-20*	P-20
ML-8605	40 mm	1	Either	S-20*	P-20
ML-8606	40 mm	3	Cathode	S-20*	P-20

*These S-20 photocathodes have extended red response.

Machlett has wide experience with designers and manufacturers of direct-view instruments, TV systems, and others with unusual applications for image intensifiers. We are prepared to provide configurations to meet a customer's special requirements, such as phosphors other than P-20, selection of tubes for particular photocathode sensitivity and gain characteristics, hermetically sealed units and many other custom features in both classified and unclassified versions.

LARGE POWER TUBES • SMALL POWER TUBES • IMAGE INTENSIFIER TUBES
1063 HOPE STREET STAMFORD, CONN. 06907

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