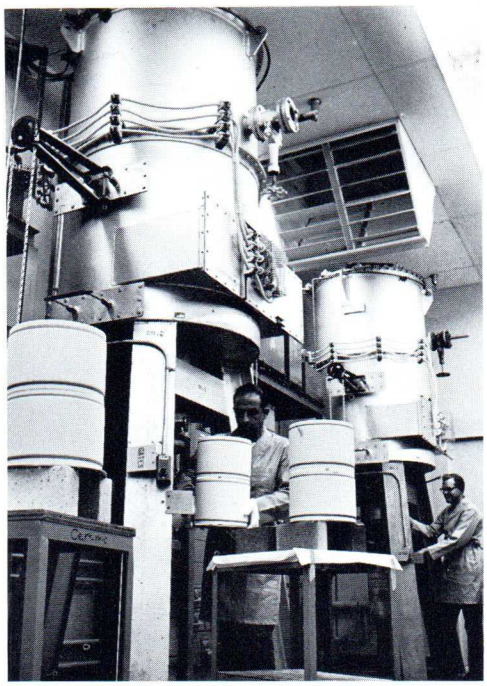
A Summary of Products and Review of Capabilities ⊞ Litton Industries Electron Tube Division 1963

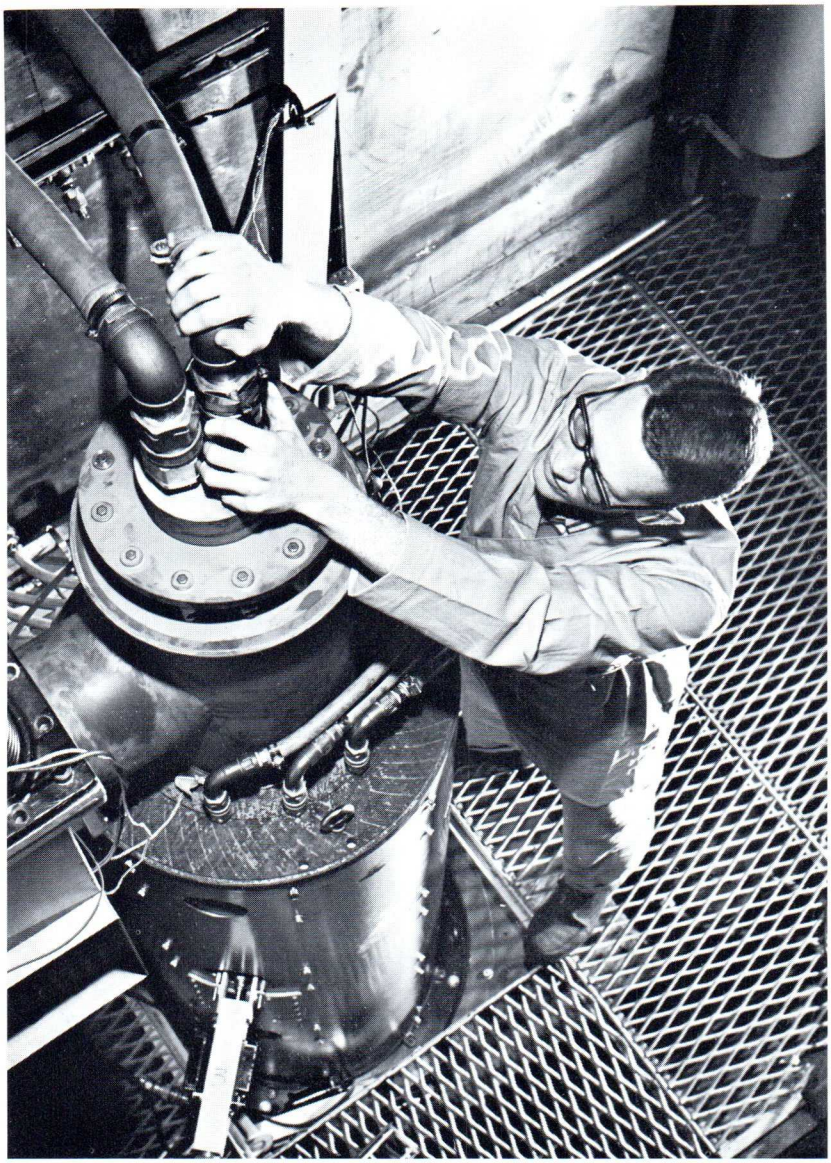
CTP1

TABLE OF CONTENTS

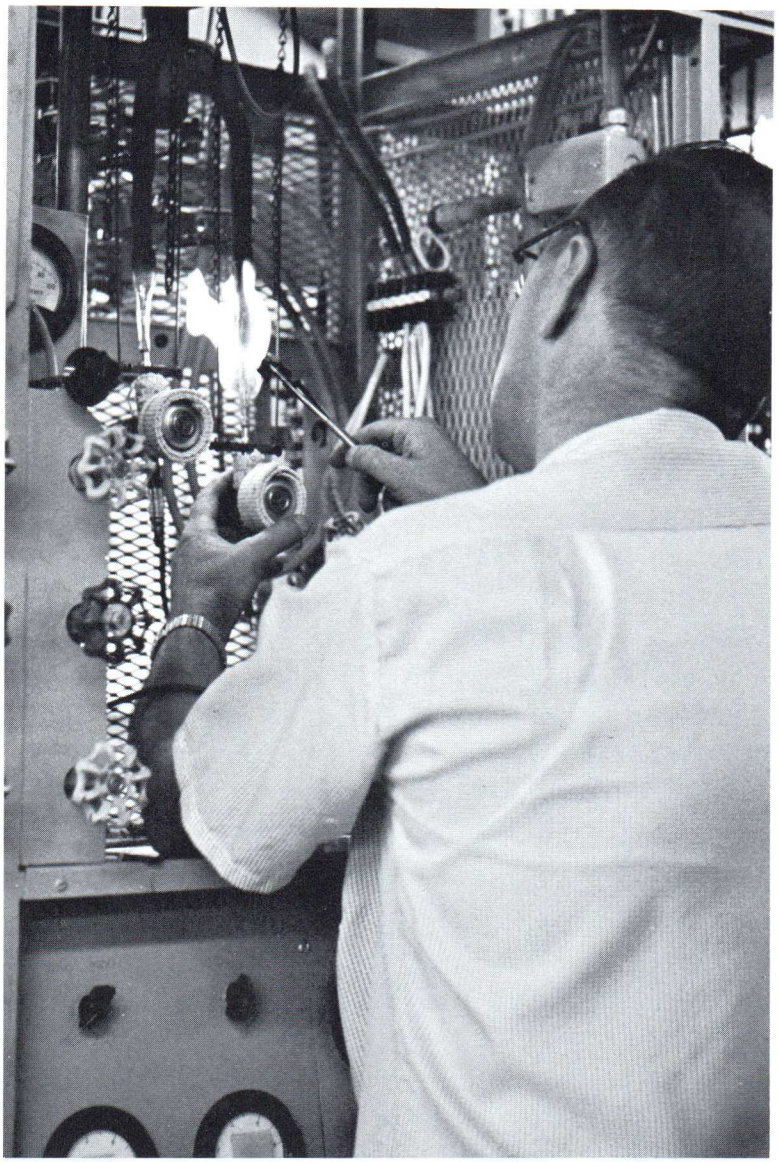
The Cover: A sunset view past a Litton Industries' klystron, through the Golden Gate Bridge to the Bay and City of San Francisco. Unfolded, untitled reprints are available by writing us at San Carlos—a San Francisco suburb.

Capability. That quality denoting outstanding ability, the power to perform with skill and competence. Claimed by most, attempted by many, attained by few in the field of electron tube technology. ¶ To the management, to the engineers, to the hundreds of production people at the Litton Industries, Electron Tube Division, capability is more than a contention, it is a corporate by-law; the dedication to the customer to invent, create, develop, modify and produce devices quickly and most efficiently. Yet, in design and production, quality is never sacrificed. ¶ Each high quality Litton tube type is designed and produced explicitly for its ultimate use. Being application rated these tubes pay off with outstanding performance that is constantly documented by transmitter reports. ¶ The ingredients? Employee pride in his work, unique production techniques, the use of the best metals and ceramics, unequalled engineering competence. Long life, naturally providing economy, is built into every Litton tube—and virtually no "aging in" is required. ¶ Founded thirty years ago and since 1953 an operating division of Litton Industries, Inc., the Electron Tube Division today employs



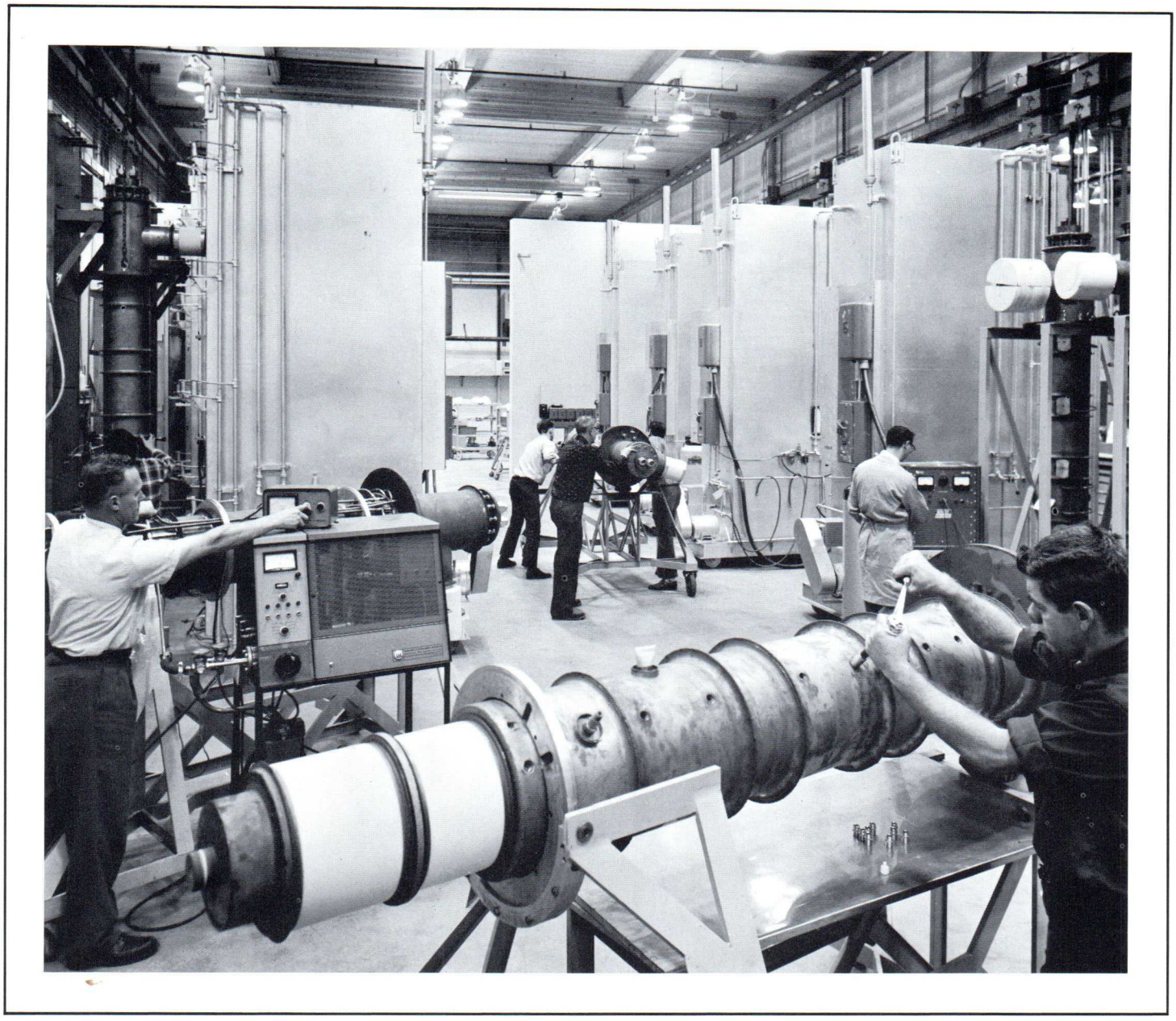


more than 1250 people, housed in five modern buildings (204,000 square feet) in San Carlos, California. Five major operating departments, each with its own engineering and production staffs, make up the nucleus of the Tube Division. They are: A) CROSSED-FIELD DEPARTMENT Products: Pulse and CW magnetrons, M-type backward wave oscillators, crossed-field forward wave amplifiers, BARRATRONS® and the MICROTRON®. B) LINEAR BEAM DEPARTMENT Products: Broadband, CW and pulsed amplifier klystrons, pulse and CW traveling wave tubes, O-type backward wave tubes, high voltage switch tubes, reflex klystrons, floating drift tube klystrons and monitor diodes. C) DISPLAY DEVICES DEPARTMENT Products: MICROPIX® high definition cathode ray tubes, scanning CRTs, PRINTAPIX® direct writing CRTs, fiber optic tubes, display components and systems, including high resolution flying spot scanners, high speed electronic printers, display consoles and special purpose recording devices. D) EQUIPMENT DEPARTMENT Products: Power supplies, microwave rf power sources, microwave amplifiers, focus coils, sockets, water loads, radiation shields, filament

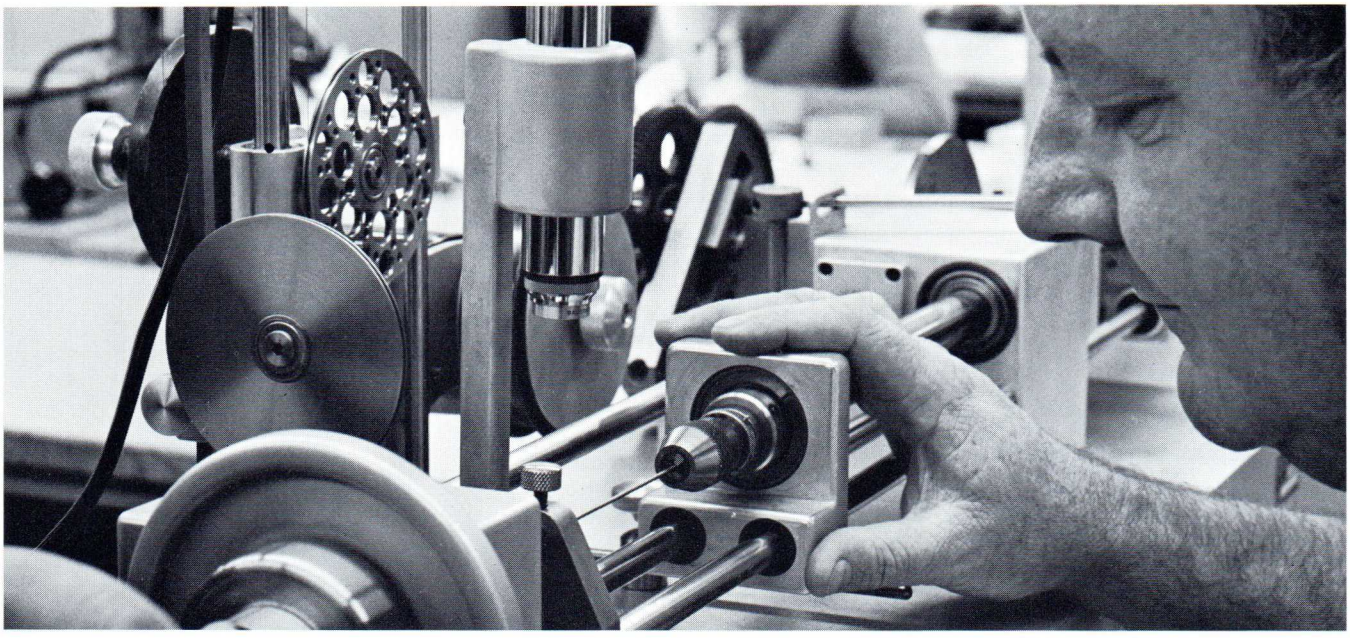


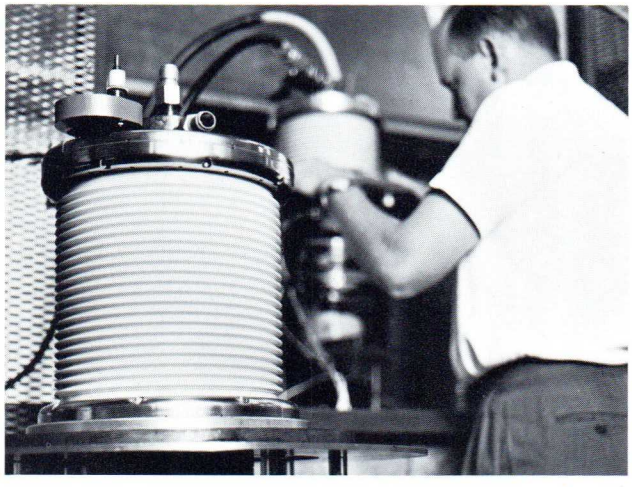
controllers, thermopiles and other tube-related equipment. E) RESEARCH LABORATORY New ideas in new areas. ¶ CROSSED-FIELD DEVICES Magnetrons have been in the Litton line since the mid-1930's; the company's good reputation is founded on them. Pulse and CW Magnetrons, more than 200 varieties of them ranging from 1 watt CW to 2 megawatts pulse, have proved outstanding performances in airborne radar, navigation and guidance, counter-measures, beacons, transponders, IFF and communications. ¶ New designs, the use of advanced materials and improved production techniques permit more rigorous processing and increase tube life to thousands of hours. Superclean rooms, with a controlled atmosphere, eliminate day to day variations. Vacuum-processing techniques, where all microwave tubes are processed at temperatures no less than 625°C, guarantee long shelf life and "snap on" dependability. ¶ The shift from design to production is minimal because Litton does not make laboratory samples as such. First samples are not one of a kind handcrafted items whose performance characteristics cannot be duplicated. Tooling is done for first samples and whether

for 2 or 2000 tubes, dies are immediately available to begin producing identical tubes with no need for transfer of information. ¶ The major supplier of countermeasure tubes, Litton introduced the family concept in the early 1950's; that is, production of a complete series of mechanically and electronically interchangeable tubes, permitting simpler systems design with coverage over many frequency bands. ¶ Families of voltage tunable backward wave oscillators, for example, provide wide band tunability with high CW powers. Applications include sweep oscillators, frequency modulated transmitters and barrage countermeasure power sources. ¶ LINEAR BEAM DEVICES Litton Industries is a world leader in the design and production of amplifier klystrons of the highest power. Klystrons operate in the frequency bands from 400 to 3000 megacycles and range in power from 2 megawatts to powers in excess of 50 megawatts. ¶ First development work utilizing linear beam interaction was undertaken more than eleven years ago by Litton Industries, under Stanford University sponsorship, with engineering personnel from both organizations contributing to the program. The result: the L-3035,

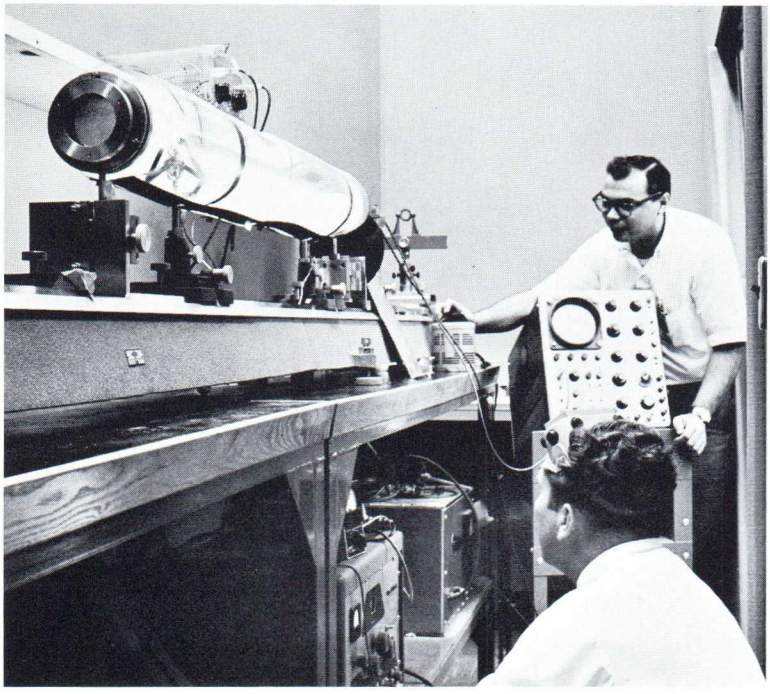


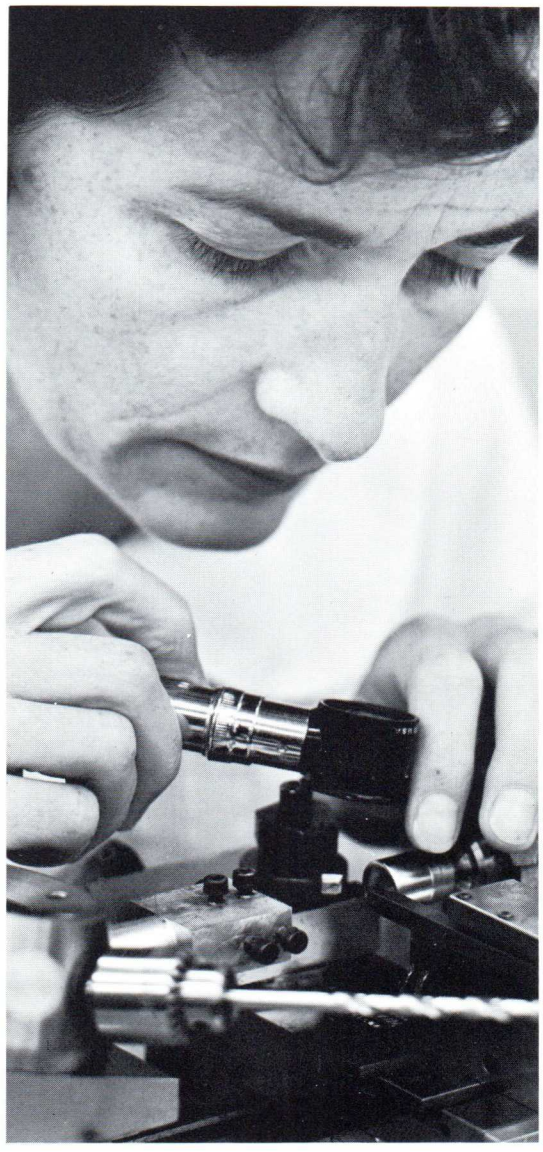
highest power L-band klystron then in existence—2 megawatts peak power. Since that time, Litton has manufactured and delivered more than 1500 of these long range radar tubes, which have averaged better than 6000 hours field life with some operating more than 20,000 rf hours. ¶ Litton was the first company to produce broadband klystrons, the result of the Litton SKIRTRON technique. This development gives wide-band performance with flat power output versus frequency and linear phase shift versus frequency. ¶ Evidence of quick response and engineering superiority may be described with the production in record quantities of the L-3403 P-band klystron for a long range, search radar. Within eight months after receipt of contract, a completely new company-funded, multimillion dollar production and testing facility had been constructed for this program, and first tubes were being delivered. ¶ Traveling wave tubes feature high reliability because of special fabrication techniques and the extreme care taken in matching thermal expansion between adjacent materials. ¶ TWTs first went into production in 1958 with X-band models, since successful engineering at this frequency guaranteed



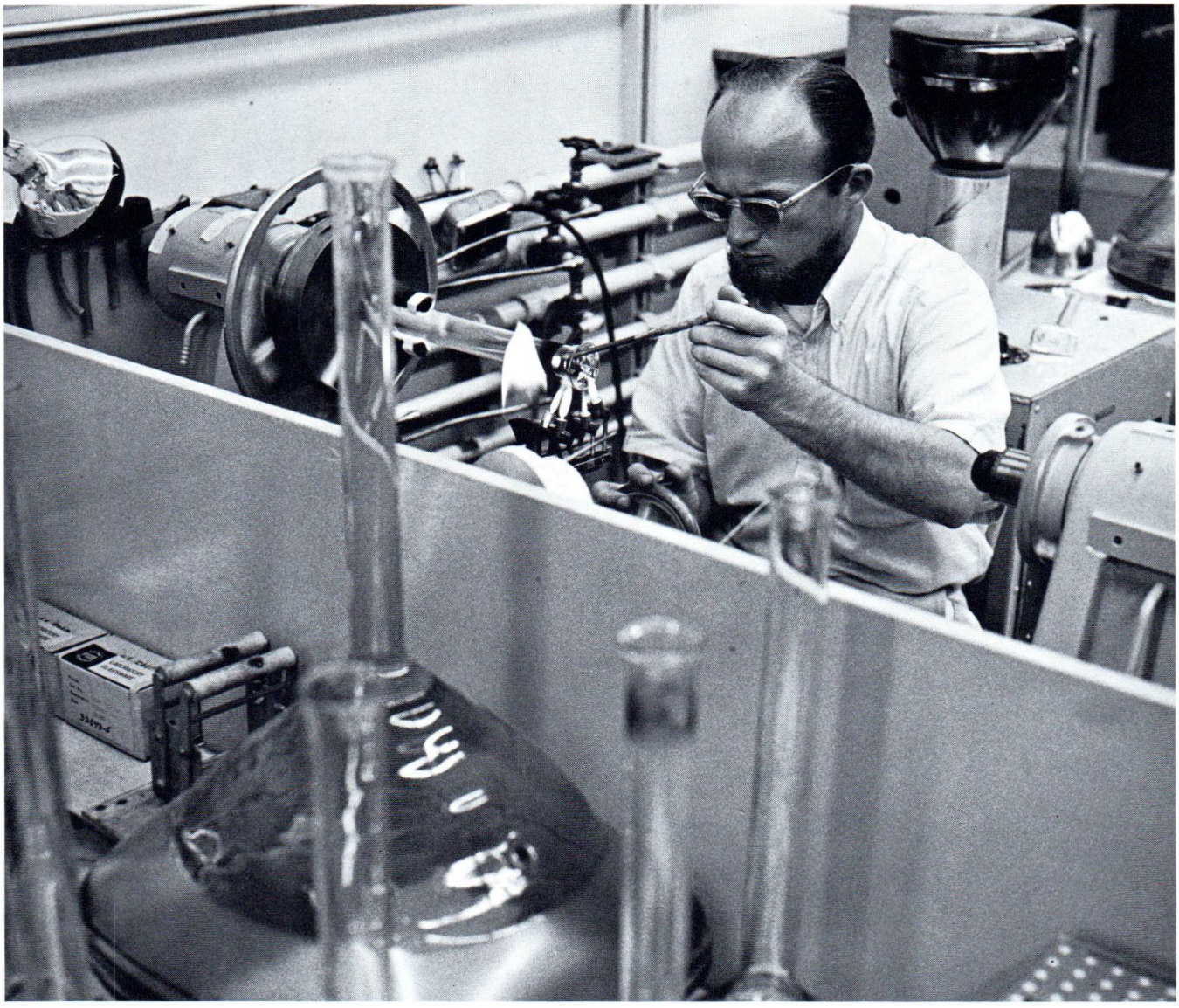


success in the lower ranges. ¶ In the past six years, Litton has pushed the state-of-the-art in power output in combination with small size, ruggedness and simplicity of operation. Improvements in attenuators and helix design have resulted in reduced power supply requirements. ¶ Litton has designed and produced a compatible family of TWTs operating in the S through X-bands. Applications include high performance aircraft and space vehicles where low voltage is required, as crystal burn-out protectors, radar enhancement, missile guidance and control, electronic counter-measures, space communications and telemetry. In addition a 10 kilowatt pulsed UHF traveling wave tube is being developed for high power klystron driver applications as well as final amplifier applications. ¶ Several years ago Litton recognized the need for high voltage switch tubes for floating deck modulator applications with high power modulating anode klystrons. Using the magnetron injection gun invented at Litton Industries, the first INJECTRON® switch tube was developed, providing good voltage hold-off and over-power capabilities in modulator service. This new type of tube overcomes the limitations



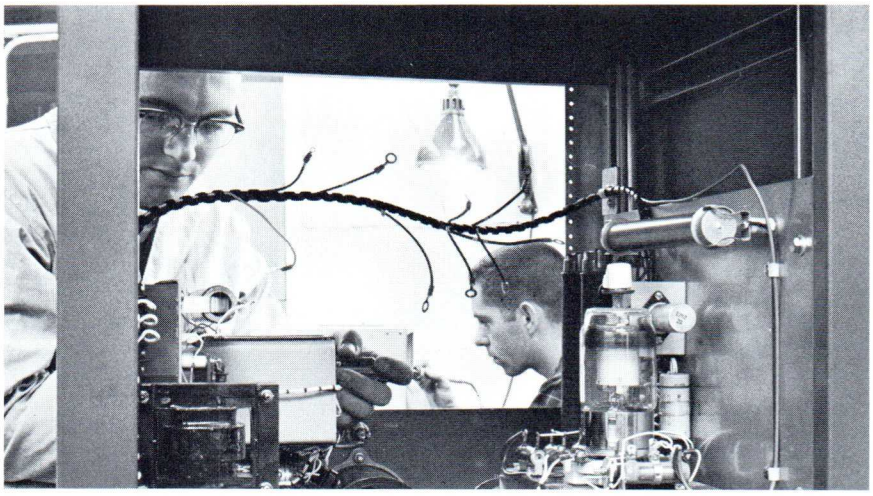


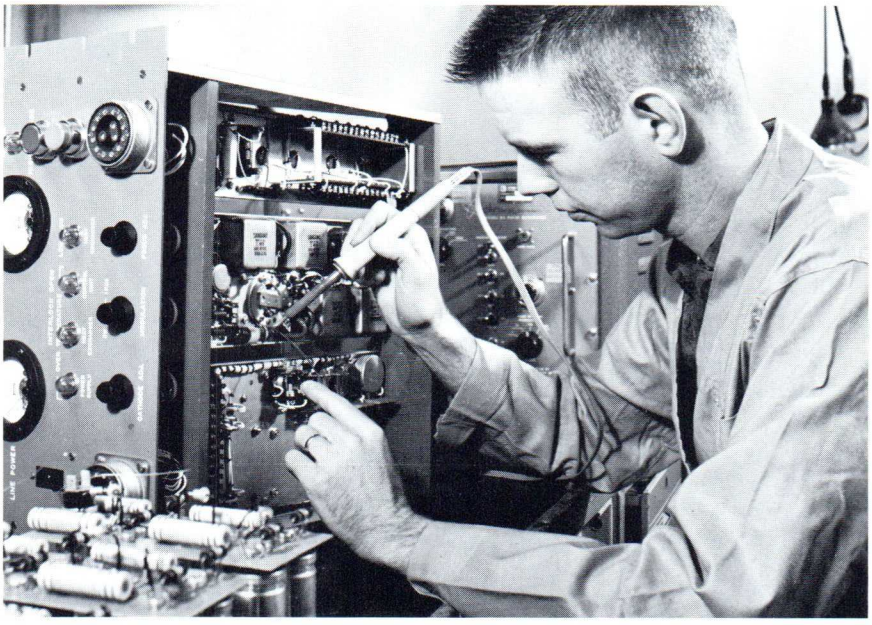
of the solid beam gun where the low microperveance results in a high grid driving voltage and high tube drop for the switching current. ¶ The succeeding group of control and low voltage beam switching tubes have provided high hold-off voltage capabilities with a wide range of pulse length and repetition rates. Fast rise times at levels exceeding 350 kilovolts collector voltages, 60 amperes collector current have been demonstrated for use in floating deck modulators, for a series modulation, for shunt regulator, for grid limiting circuits and for oscillators. ¶ Complementing the line of linear beam devices are the reflex klystrons and floating drift tube klystrons in the millimeter wave range developed and manufactured by Elliott-Litton, Ltd. Since 1961 Litton has marketed these tubes, as well as monitor diodes, through San Carlos. ¶ DISPLAY DEVICES With a philosophy based on utilization of a select group of specialists, close quality control, and concentration on forward looking designs and techniques, the Display Devices Department of Litton Industries has shown an outstanding capability in tubes, components and equipment for electronic display and information handling systems. ¶



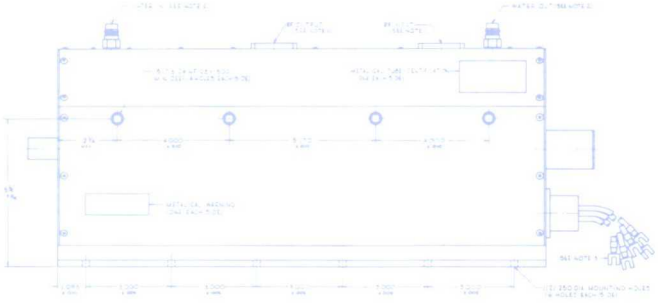
Years of experience have led to the design and manufacture of a wide variety of specialized cathode ray tubes and accessory equipments to utilize the advanced capabilities of these tubes. Production "firsts" have been attained in such categories as high resolution, high brightness cathode ray tubes, high speed alphanumeric character generator tubes, electrostatic printing tubes, fiber optic CRTs and specialized display driving equipment. ¶ Litton Tube Division devices in the field have demonstrated their exceptional capabilities in such applications as high speed or real time displays with high compression or expansion capability, remote display, multiple displays and document retrieval. The PRINTAPIX® CRT will print out on hard copy without liquid developers on nonsensitized papers at speeds up to ten feet per second. Litton Industries' fiber optic CRTs, with built-in precision deflection systems, are used for exposing film at high speed by direct contact. ¶ During the past five years, the Display Devices group has achieved, among other devices, the following state-of-the-art original developments: a. first precision mounted and aligned beam ruggedized CRT for airborne radar display.

b. highest resolution, highest light output CRT. c. first sealed-off, area mosaic and 1000 element per inch high speed electrostatic writing tubes. d. first high speed computer readout devices with an ultimate capability of printing at one microsecond per character from a digital input. e. first gun supply/video amplifier for driving CRTs with wide band signals in the depressed cathode mode. f. delivery in production quantities of first practical fiber optic face plate CRTs. ¶ EQUIPMENT & ACCESSORIES Because of the close integration between microwave tubes and the equipment required to operate these tubes, an autonomous Equipment Department was formed in recent years to provide the customer with equipments compatible with microwave tubes. ¶ In reality, there has been a group assigned to equipment construction at Litton for more than fifteen years. This group of engineers and technicians influenced the growth of the microwave tube industry by developing techniques and manufacturing hardware to support the rapid advancements. The resulting experience has brought about a highly capable staff engaged in the design and manufacture of equipments and

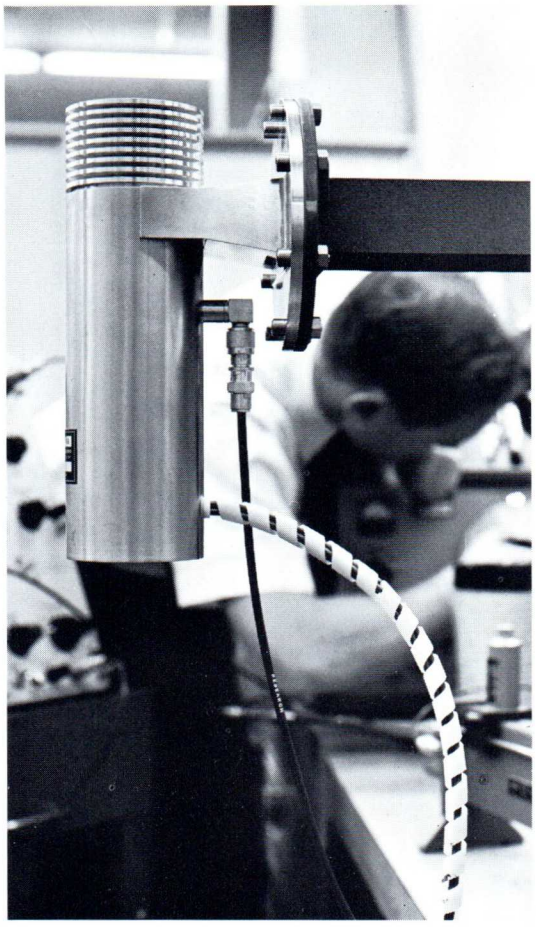


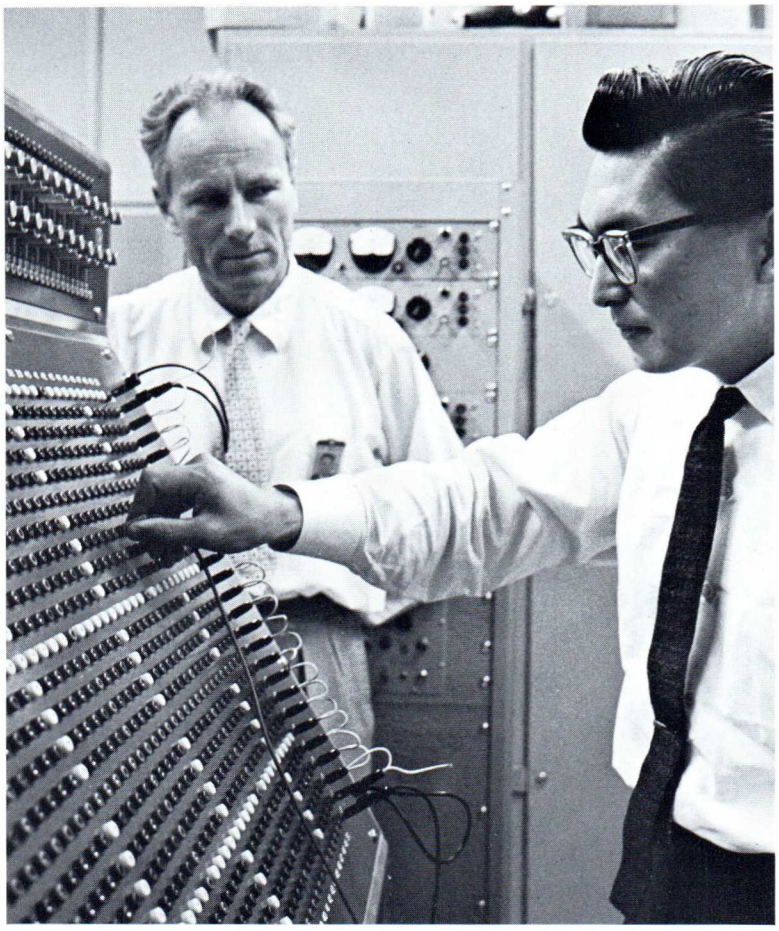


products related to microwave power tubes. ¶ Capability is appropriately displayed by the listings of tube types in this catalog. The Equipment Department has designed and manufactured nearly every type of process and test equipment required in the development and production of these microwave power tubes. The equipments range from induction heaters, vacuum furnaces, and complete test stations to auxiliary tube equipments such as sockets and focusing coils. ¶ In addition, the department maintains a close liaison with tube customers to insure test parameters that meet the customer's system requirements. This insight on applications further broadens the technological background from which the engineering group draws its knowledge. ¶ Numerous "customer engineered" products include: special purpose microwave power sources, modulators and power supplies; electromagnets for electron beam focusing, deflection and switching; and testing systems for high power microwave tubes and components. The Equipment Department not only serves the tube customer, but continues to work closely with production and research departments at the Electron Tube Division.



RESEARCH LABORATORY New systems concepts are rapidly being developed—with these must unfold new and sophisticated electron devices; that is, new ideas in new areas are required. From this need the Litton Industries' Electron Tube Research Laboratory evolved. ¶ Realizing the need for a strong company-oriented research program, the Litton Industries' Tube Division established its own specialized Research Laboratory in 1959. Prior to that time, research was confined to individual product lines where tube performance upgrading took precedence over basic research on new electron devices. ¶ During the past four years, a well-integrated, expertly-staffed team of scientists has been molded, making up a nucleus of personnel capable of delving into and solving a wide range of problems relative to electron devices. Key scientists, backed by a highly qualified staff, include such well-known engineers as Research Director Dr. Joseph F. Hull and Senior Scientists Drs. J. Richard Hechtel, Philip N. Hess and Wilbur H. Watson. ¶ Through research, this Division has greatly extended its areas of interest and activity. To illustrate: Today, working models of gaseous and solid state lasers have been built and further advanced research and development is being continued under both company and government funding. New super power broadband klystrons are being produced using the hollow-beam principle with a magnetron injection gun invented by Litton Industries personnel. New high power switch tubes are also the result of the injection beam gun developed in the Research Laboratory. ¶ The

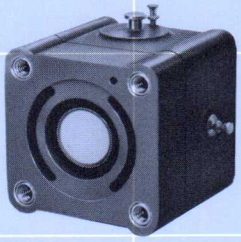




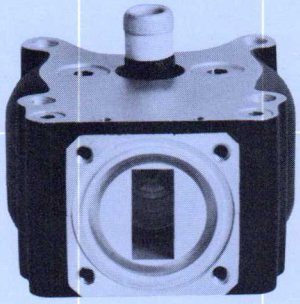
Precision Resistance Network Analogue was invented by a Litton scientist and is now being used extensively in solving electron optical problems. This device replaces less accurate means of solving boundary value problems involving solutions to Poisson's, Laplace's, and special cases of Maxwell's equations. For example, the electron-optical system of the new electrostatically focused klystron, L-3668, was designed in a fraction of the usual time by utilizing the Network Analogue, taking into consideration space charge and rf de-bunching forces. ¶ Two extremely significant developments in the crossed-field area are the Distributed-Emission Crossed-Field Amplifier (DEMATRON) and the Injected-Beam Crossed-Field Amplifier (BIMATRON). The extension of this is the BIDEMATRON, now under development, which combines the high gain of a BIMATRON with the high power of a DEMATRON. ¶ In addition to the above-mentioned programs, Research Laboratory scientists, engineers, and technicians are also currently working on the following projects: Electron Optics Studies, Ion-Propulsion, Slow-Wave Structure Studies, Millimeter Wave Generation, Low Noise Research, Plasma Physics, Quantum Electronics, Solid State Devices, and Light Amplifiers. ¶ The Litton Industries' Research Laboratory occupies approximately 12,000 square feet in modern facilities at San Carlos. Specialized equipment and facilities include a newly completed spectrograph room, a space chamber to study and record electron interaction, and a new laser development laboratory, which has sophisticated measuring equipment.

22 in.

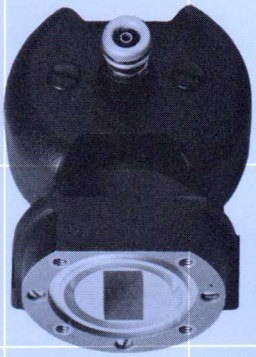
20 in.



A



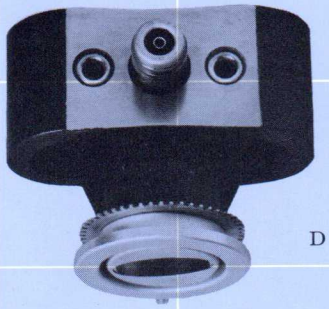
B



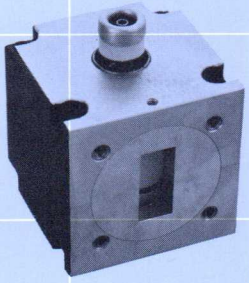
C

18 in.

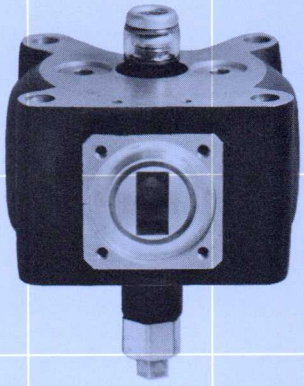
16 in.



D



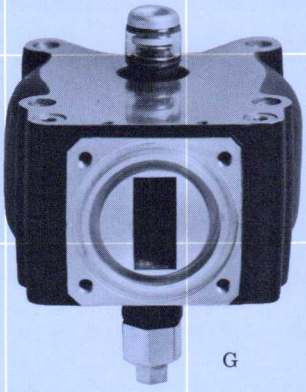
E



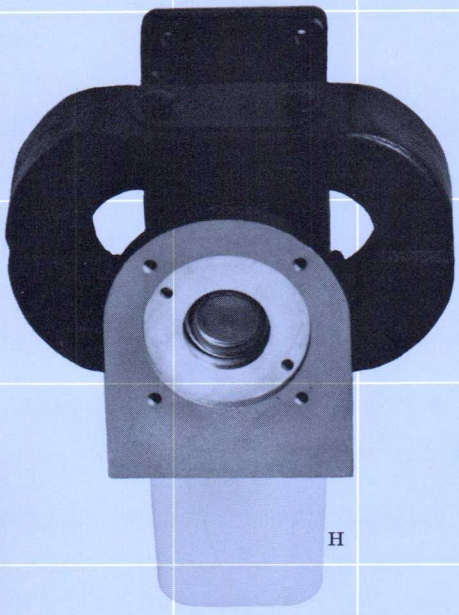
F

14 in.

12 in.



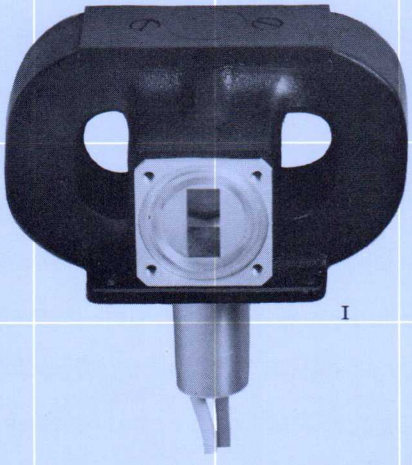
G



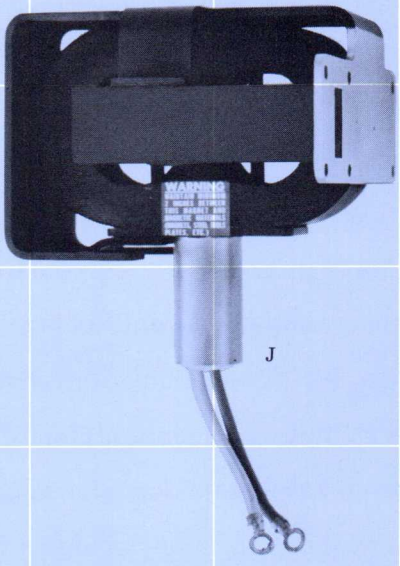
H

10 in.

8 in.



I



J

6 in.

4 in.

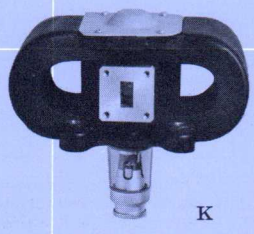
2 in. 4 in. 6 in. 8 in. 10 in. 12 in. 14 in. 16 in.

PULSE MAGNETRONS

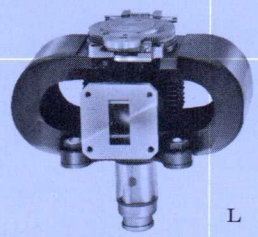
	Tube Type	Minimum Peak Power kw	Frequency Mcs	Nominal Operating Characteristics				Max. Duty %	Max. Wt. oz.	
				Ef Volts	If Amps	eb volts	ib amps			
A	*L-3820*	0.01	8500 ± 300	6.3	0.5	500	.120	10.0	12	This small, lightweight positive anode high duty pulse magnetron is available to a selected frequency in the range 8200 to 8800 megacycles. As a CW device, this tube is capable of delivering 1.0 watt minimum power. Like all Litton magnetrons, good performance may be achieved after shelf storage up to five years.
B	*L-3602*	0.03	8600 ± 40	6.3	0.50	550	0.30	2.7	22	This series of extremely ruggedized, fixed frequency pulse magnetrons provides a wide range of power levels. Designed with excellent electrical characteristics and shock resistance features, these miniature magnetrons are particularly applicable for high performance aircraft, missile and satellite systems. Low thermal factors (less than 75 Kc/°C), high frequency stability, and short pulse operation (.020 us and less) make these tubes exceedingly versatile. Other frequency versions throughout high X-band are available.
	L-3105	0.10	9300 ± 40	6.3	0.50	800	0.55	2.7	22	
	L-3434	0.10	9950 ± 30	6.3	0.50	800	0.55	2.7	22	
	L-3603	0.50	9300 ± 30	6.3	0.50	1300	1.30	2.0	22	
	L-3429	1.0	9300 ± 30	6.3	0.50	1400	2.20	0.5	22	
	L-3604	1.0	9300 ± 30	6.3	0.50	2800	1.33	0.3	22	
	L-3238	1.0	9340 ± 30	6.3	0.50	2800	1.33	0.3	22	
	L-3239	2.0	9300 ± 30	6.3	0.50	3300	2.25	0.2	22	
	L-3605	3.0	9300 ± 30	6.3	0.50	3600	3.15	0.1	22	
	L-3268	4.0	9300 ± 30	6.3	0.90	3900	4.00	0.1	22	
C	*L-3089*	0.04	8800 ± 25	6.3	0.90	850	0.20	25.0	20	Designed for pulse doppler and beacon applications where extremely high duty is essential, this pulse magnetron is available with warranted operation for 1000 or 2000 hours.
D	*L-3212*	0.12	9000 to 9020	6.3	0.50	800	0.55	2.7	16	These rugged, lightweight, tunable pulse magnetrons, designed for beacon and transponder applications, give stable frequency operation with coded pulse groups and have duties as high as 25 per cent. High average duty ratings and capability for short pulse operation (.020 us and less) make possible many applications. Features such as narrow tuning range, low electrical potentials, filament voltage, and ability to be pulse with a complex code, permit battery-powered applications in high performance miniaturized systems. Other frequency versions are available.
	L-3213	0.12	9050 to 9070	6.3	0.50	800	0.55	2 7	16	
	L-3214	0.12	9100 to 9120	6.3	0.50	800	0.55	2.7	16	
	L-3218	0.12	9150 to 9170	6.3	0.50	800	0.55	2.7	16	
	L-3226	0.12	9180 to 9200	6.3	0.50	800	0.55	2.7	16	
	L-3180	0.12	9200 to 9220	6.3	0.50	800	0.55	2.7	16	
	L-3181	0.12	9250 to 9270	6.3	0.50	800	0.55	2.7	16	
	L-3028D	0.12	9280 to 9330	6.3	0.50	800	0.55	2.7	16	
	L-3601	0.12	9315 to 9340	6.3	0.50	800	0.55	2.7	16	
	L-3327	0.12	9365 to 9385	6.3	0.50	800	0.55	2.7	16	
	L-3187	0.12	9250 to 9270	5.0	0.60	800	0.55	2.7	16	
	L-3087A	0.12	9280 to 9320	5.0	0.60	800	0.55	2.7	16	
	L-3384	1.0	9280 to 9320	6.3	0.50	2800	1.33	0.3	16	
	L-3058	1.0	9300 to 9320	6.3	0.50	2800	1.33	0.3	16	
	L-3225	1.0	9310 to 9350	6.3	0.50	2800	1.33	0.3	16	
E	*L-3813*	0.5	9300 ± 30	6.3	0.90	1300	1.30	1.0	16	Packaged in 2″ cube permanent magnets, these ruggedized, low voltage pulse magnetrons have been designed for beacons, IFF, interrogators and portable radars. All metal and ceramic in construction, they are processed in super-clean environment. Exceptional features include high duty rating, quick 13-second warmup, high efficiency (nominally 35 per cent), highest frequency stability, negligible missing pulses and nearly constant power with life. Tunable versions are planned.
	L-3812	1.0	9300 ± 30	6.3	0.90	1400	2.20	0.5	16	
F	*L-3358*	1.0	16,000 to 16,500	6.3	0.95	3000	2.00	0.3	21	This group of highly ruggedized miniature Ku-band pulse magnetrons has been designed for use in high performance aircraft and missile applications. They may be pulsed with high duty coded pulse groups or with single short pulses. Special design features provide a low thermal factor (less than 150 Kc/°C) and stable frequency operation. Fixed frequency versions are available throughout the frequency ranges of the tunable tubes.
	L-3383	1.0	16,250 to 16,300	6.3	0.95	3000	2.00	0.3	21	
	L-3496	1.0	16,000 to 16,500	6.3	0.70	3000	1.60	0.3	19	
	L-3359	2.0	16,000 to 16,500	6.3	0.95	3600	2.75	0.3	21	
	L-3498	2.0	16,280 to 16,320	6.3	0.95	3600	2.75	0.3	21	
	L-3452	2.2	16,200 ± 75	6.3	0.95	3600	2.75	0.3	20	
	L-3645	4.0	16,200 ± 100	6.3	0.95	4000	3.75	0.1	20	
G	*L-3379*	1.0	8800 to 9500	6.3	0.90	3350	1.15	0.3	22	Greater flexibility for beacons, transponders and small radar systems is achieved with these highly ruggedized, tunable pulse magnetrons. Quick warmup, extremely short pulse operation, and stable frequency operation are representative of these long life, reliable tubes.
	L-3380	2.0	8800 to 9500	6.3	0.90	3450	2.25	0.2	22	
	L-3381	3.0	8800 to 9500	6.3	0.90	3600	3.25	0.1	22	
	L-3382	4.0	8800 to 9500	6.3	0.90	4000	4.00	0.1	22	
H	*L-3023*	7.0	9280 to 9345	6.3	1.0	5800	3.8	0.3	4 1/8 lbs.	This series of extremely reliable pulse magnetrons has been designed to provide a variety of tuning ranges for use in airborne navigational and rendezvous beacons where stable frequencies are required. These long life magnetrons are mechanically designed to permit the attachment of tuning gears and waveguide output assemblies without the normally required shock and vibration isolation sections. Other frequency versions are available.
	L-3029A	7.0	9235 to 9300	6.3	1.0	5800	3.8	0.3	4 1/8 lbs.	
	L-3029B	7.0	9250 to 9315	6.3	1.0	5800	3.8	0.3	4 1/8 lbs.	
	L-3029C	7.0	9295 to 9360	6.3	1.0	5800	3.8	0.3	4 1/8 lbs.	
	L-3029D	7.0	9265 to 9330	6.3	1.0	5800	3.8	0.3	4 1/8 lbs.	
I	*L-3635*	10.0	9375 ± 30	6.3	1.3	6000	6.0	0.2	3 3/4 lbs.	By conservative design and rigorous processing, these magnetrons provide many thousands of hours of stable performance. These tubes are available with warranted operation for 1000 hours.
	L-3431	18.0	9375 ± 30	6.3	1.3	7000	7.0	0.1	3 3/4 lbs.	
	L-3654	24.0	9375 ± 30	6.3	1.3	8000	8.25	0.1	3 3/4 lbs.	
J	*L-3469*	20.0	9375 ± 30	12.6	0.5	7250	7.25	0.1	4 1/4 lbs.	

Litton Industries, Electron Tube Division, San Carlos, California

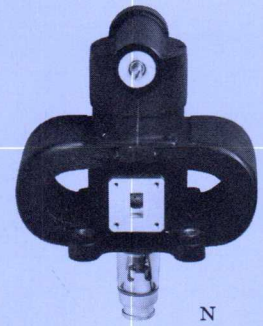
48 in.



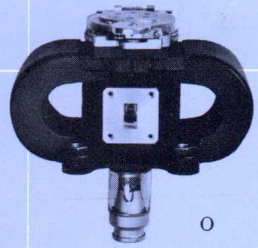
K



L

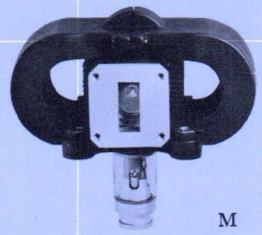


N



O

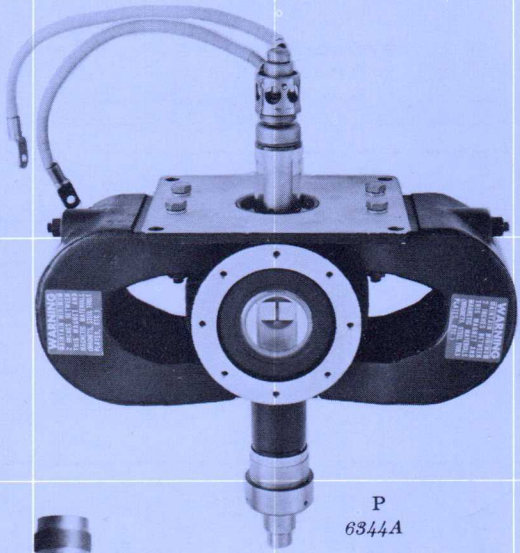
42 in.



M

36 in.

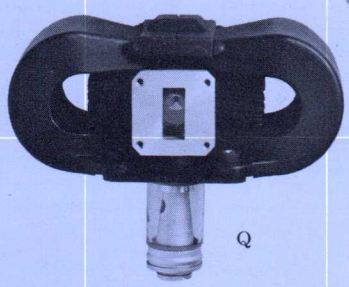
P
7156



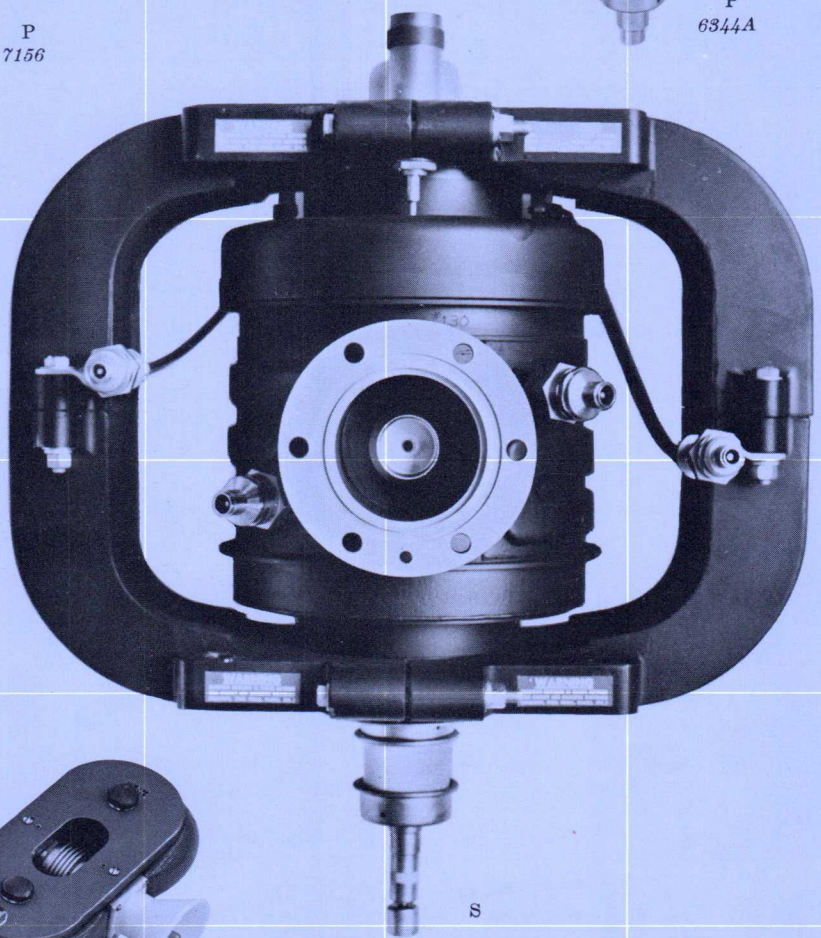
P
6344A

30 in.

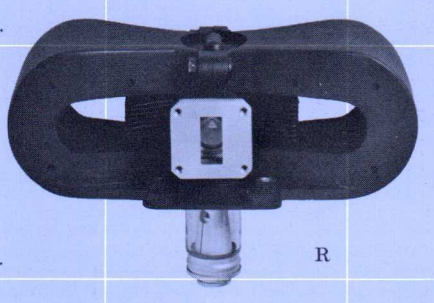
24 in.



Q



18 in.



R

12 in.

6 in.

T

U

S

6 in.

12 in.

18 in.

24 in.

30 in.

36 in.

PULSE MAGNETRONS

	Tube Type	Minimum Peak Power kw	Frequency Mcs	Nominal Operating Characteristics				Max. Duty %	Max. Wt. lbs.	
				Ef Volts	If Amps	eb kilovolts	ib amps			
K	*L-3816*	25.0	16,500 ± 150	12.6	2.4	12.0	12.0	0.2	5½	Rigorous high temperature processing standard with all Litton products makes possible reliable long life Ku-band fixed frequency tubes such as the L-3816, L-3738, L-3326 and L-3759.
	L-3738	40.0	16,500 ± 150	12.6	2.4	14.0	14.0	0.1	5½	
	L-3326	60.0	16,500 ± 150	12.6	2.4	16.0	16.0	0.1	5½	
	L-3759	60.0	15,550 ± 100	12.2	2.4	16.0	16.0	0.1	5½	
L	*L-3103*	30.0	8500 to 9600	12.6	2.3	12.5	10.0	0.2	6⅛	Extensive life testing of the 6543 X-band magnetron has demonstrated that it is one of the most reliable tunable magnetrons available today, capable of well over 1000 hours of stable performance under rugged cycle operation. The L-3103 is recommended for systems requiring higher duty operation, and the 6543A for MTI systems requiring low jitter performance.
	6543	65.0	8500 to 9600	12.6	2.3	15.0	15.0	0.1	6⅛	
	6543A	65.0	8500 to 9600	12.6	2.3	15.0	15.0	0.1	6⅛	
M	*L-3168*	30.0	9375 ± 30	12.6	2.3	12.5	10.0	0.2	6	These pulse magnetrons are recommended for use in all airborne applications where extreme reliability, combined with compactness and high efficiency, are required. Fixed frequency versions of the proven, long life, 4J52A magnetron other than those listed here are available upon request. The L-3168 is recommended for systems requiring higher duty operation and the 6510 for MTI systems requiring low jitter performance.
	4J52A	70.0	9375 ± 30	12.6	2.3	15.0	15.0	0.1	6	
	6510	65.0	9375 ± 30	12.6	2.3	15.0	15.0	0.1	6	
	L-3036A	65.0	9410 ± 5	12.6	2.3	15.0	15.0	0.1	6	
	L-3036B	65.0	9275 ± 15	12.6	2.3	15.0	15.0	0.1	6	
	L-3036F	65.0	9245 ± 30	12.6	2.3	15.0	15.0	0.1	6	
N	*L-3083A*	60.0	16,000 to 17,000	12.6	2.4	17.0	16.0	0.1	6⅛	Long life and reliable performance are characteristic of these tunable Ku-band magnetrons which are rated for 1.0, 2.0 and 3.0 microsecond pulse operation respectively. The special tuner, which sweeps the frequency range in approximately five turns, is designed for use with a multi-position Collins tuner drive.
	L-3083B	60.0	16,000 to 17,000	12.6	2.4	17.0	16.0	0.1	6⅛	
	L-3083C	60.0	16,000 to 17,000	12.6	2.4	17.0	16.0	0.1	6⅛	
O	*L-3101A*	60.0	16,000 to 17,000	12.6	2.4	17.0	16.0	0.1	5¾	This series of tunable Ku-band magnetrons rated for 1.0, 2.0 and 3.0 microsecond pulse operation respectively is similar to the L-3083 series except that approximately 120 turns are required to traverse the frequency range. Tuning may be manual or by mechanical servo-drive.
	L-3101B	60.0	16,000 to 17,000	12.6	2.4	17.0	16.0	0.1	5¾	
	L-3101C	60.0	16,000 to 17,000	12.6	2.4	17.0	16.0	0.1	5¾	
P	*6344A*	175	5450 to 5825	13.5	2.5	21.5	22.0	0.1	25	Proven long life with recorded operational and field life in excess of 3500 rf hours at C-band is available in the 6344A and 7156 magnetrons. Both the 6344A and the higher-powered version, the 7156, require no ageing-in prior to operation after a lengthy shelf life. Applications include shipboard and airborne search and weather radar and surveillance systems.
	7156	250	5450 to 5825	5.0	5.0	25.0	24.0	0.1	35	
Q	*4J50A*	225	9375 ± 30	13.75	3.35	21.5	27.5	0.1	10	Fixed frequency versions of the widely used, reliable 4J50 magnetron are used in systems requiring multi-frequency operation. Compactness and efficiency make these tubes especially suitable for airborne fire control systems. The L-3613 magnetron is a high pulling version of the 4J50 designed for frequency modulation and frequency diversity applications. A minimum of 30 Mc of frequency shift is obtained by varying the phase of a 2.0:1 VSWR.
	L-3039D	225	8800 ± 20	13.75	3.35	21.5	27.5	0.1	10	
	L-3039E	225	8860 ± 20	13.75	3.35	21.5	27.5	0.1	10	
	L-3039F	225	8920 ± 20	13.75	3.35	21.5	27.5	0.1	10	
	L-3039G	225	8980 ± 20	13.75	3.35	21.5	27.5	0.1	10	
	L-3039H	225	9040 ± 20	13.75	3.35	21.5	27.5	0.1	10	
	L-3039I	225	9100 ± 20	13.75	3.35	21.5	27.5	0.1	10	
	L-3039J	225	9160 ± 20	13.75	3.35	21.5	27.5	0.1	10	
	L-3039K	225	9220 ± 20	13.75	3.35	21.5	27.5	0.1	10	
	L-3039L	225	9280 ± 20	13.75	3.35	21.5	27.5	0.1	10	
	L-3039M	225	9340 ± 20	13.75	3.35	21.5	27.5	0.1	10	
	L-3039N	225	9400 ± 20	13.75	3.35	21.5	27.5	0.1	10	
	L-3039P	225	9375 ± 30	13.75	3.35	21.5	27.5	0.1	10	
	L-3039R	225	8790 ± 90	13.75	3.35	21.5	27.5	0.1	10	
	L-3613	225	9375 ± 30	13.75	3.35	21.5	27.5	0.1	10	
R	*L-3030*	300	9375 ± 30	13.75	3.35	27.5	27.5	0.1	14	These high power versions of the standard 4J50 magnetron are designed for component testing and are not recommended for system applications. Enlarged magnets provide additional power source.
	L-3030B	300	9000 ± 30	13.75	3.35	27.5	27.5	0.1	14	
	L-3030C	300	9200 ± 30	13.75	3.35	27.5	27.5	0.1	14	
S	*L-3455*	2.0MW	406 to 450	6.5	55	55	97.2	.002	220	This two-megawatt, all metal and ceramic, tunable, UHF pulse magnetron is intended for high power airborne search radar. The L-3455 provides long life, high reliability, negligible missing pulses, and high efficiency. This tube is capable of withstanding high shock and vibration. Liquid cooling is required on tuner and anode assemblies.
T	*L-3751*	5.0	34,900 ± 500	6.3	2.0	9.0	3.0	0.1	2.2	These pulse magnetrons in the millimeter wave range have been designed and are now being manufactured by Lignes Telegraphiques Et Telephoniques, Paris, France. These and other high frequency magnetrons from LTT are made available through Litton Industries, Electron Tube Division.
U	*L-3752*	40.0	34,900 ± 500	6.3	4.0	14.0	13.0	0.04	8.5	The three higher power magnetrons require forced air cooling. All are compact and ruggedized. Each tube is supplied with its individual data sheet.
	L-3856	40.0	34,900 ± 500	6.3	7.0	14.0	13.0	0.1	12.0	
	L-3753	100.	34,900 ± 500	6.3	7.5	19.5	22.5	0.04	14.0	


48 in.
42 in.
36 in.
30 in.
24 in.
18 in.
12 in.
6 in.
V
L-3461
V
L-3467
W
L-3502
W
L-3505
V
L-3460
W
L-3504
X
L-3510
Y
L-3721
Y
L-3724
Y
L-3728
Z1
Z
6 in.
12 in.
18 in.
24 in.
30 in.
36 in.

CW/PULSE MAGNETRONS

	Tube Type	Tunable Frequency Mcs	Minimum CW Power Watts	Nominal CW Characteristics Eb kilovolts	Nominal CW Characteristics Ib ma	Minimum Pulse Power kw	Nominal Pulse Characteristics eb kilovolts	Nominal Pulse Characteristics ib amps	Cooling	Max. Height in.	Max. Weight lbs.
V	*L-3456*	350 to 590	165	3.0	150	0.6	3.5	0.5	Liquid	10½	18
	L-3714	475 to 725	165	3.5	200	1.5	4.5	0.8	Liquid	10½	18
	L-3459	590 to 975	165	3.0	150	0.6	3.5	0.5	Liquid	10½	18
	L-3465	975 to 1500	400	4.0	300	2.0	4.6	0.8	Liquid	10½	18
	L-3464	1500 to 2350	400	4.0	325	2.0	4.8	0.8	Liquid	10½	18
	L-3460	2350 to 3575	500	4.0	300	2.0	4.5	0.8	Liquid	10½	18
	L-3461	3575 to 4975	350	4.0	250	1.5	4.5	0.8	Liquid	10½	18
	L-3467	4975 to 6175	400	4.2	250	2.0	4.6	0.8	Liquid	10½	18
	L-3468	6175 to 7275	300	4.2	200	1.8	4.6	0.8	Liquid	10½	18
	L-3462	7275 to 8775	300	4.4	200	1.5	5.0	0.8	Liquid	10½	18
	L-3463	8775 to 10,475	250	4.4	200	1.5	5.0	0.8	Liquid	10½	18
W	*L-3502*	975 to 1500	110	3.2	130	0.9	3.8	0.6	Forced Air	11½	18
	L-3503	1500 to 2350	110	3.2	130	0.9	3.8	0.6	Forced Air	11½	18
	L-3504	2350 to 3575	110	3.2	130	0.9	3.8	0.6	Forced Air	11½	18
	L-3505	3575 to 4975	110	3.2	130	0.9	3.8	0.6	Forced Air	11½	18
	L-3506	4975 to 6175	110	3.2	130	0.8	3.8	0.6	Forced Air	11½	18
	L-3507	6175 to 7275	110	3.2	130	0.8	3.8	0.6	Forced Air	11½	18
	L-3508	7275 to 8775	110	3.2	130	0.7	3.8	0.6	Forced Air	11½	18
	L-3509	8775 to 10,475	110	3.2	130	0.7	3.8	0.6	Forced Air	11½	18

Two families of Litton Industries' CW/Pulse Magnetrons, intended for CW, modulated CW or high duty pulse operation, provide power from 110 to 500 watts average and 600 watts to 2 kilowatts peak within the frequency range 350 to 10,475 megacycles. All tubes in these series are packaged in 7½ inch diameter bowl magnets, are equipped with tuning knobs, have 93 watt filaments and standby filament voltage rated nominally at 5.5 volts. Each of the tubes within a series are interchangeable with the exception of the rf output fitting.

MICROTRON®

	Package Type	Fixed Frequency Mcs	Minimum Power Watts	Minimum Liquid Cooling gpm	Nominal Input Ratings E_{line} Volts	Nominal Input Ratings I_{line} Amps
X	*L-3510*	2450	1000	0.55	220	25

The Litton Industries' MICROTRON® CW microwave heating unit has been primarily designed for use in ovens for modern food preparation and for industrial heating purposes. This package has been engineered for quick eight-second warmup, high power and long-life warranted operation.

The complete microwave unit includes a CW Magnetron, a high voltage transformer, a filament and isolation transformer, and an electromagnet and filter assembly.

The MICROTRON® power source may be tailored to specific equipments.

M-TYPE BACKWARD WAVE OSCILLATORS

	Tube Type	Tunable Frequency Mcs	Minimum Power Watts	INPUT RATINGS (with respect to cathode) Delay Line E_{b2} Kv	Delay Line I_{b2} mA	Accelerator E_{b1} Kv	Accelerator I_{b1} mA	Sole E_{so} Kv	Sole $+E_{so}$ Max. V p-p	Grid I_{so} mA	Grid E_c Volts	Grid I_c mA	Max. Wt. Lbs.
Y	*L-3721*	1000-1400	200	2.3 to 4.0	300	.90 to 1.9	0 to +3	—.90 to —3.4	1800	—20 to + 5	—100 to —700	—3 to +3	27
	L-3724	2500-3550	180	2.3 to 4.0	300	.90 to 1.9	0 to +3	—.90 to —3.4	1800	—20 to + 5	—100 to —700	—3 to +3	16
	L-3725	3500-4850	180	2.3 to 4.0	300	.90 to 1.9	0 to +3	—.90 to —3.4	1800	—20 to + 5	—100 to —700	—3 to +3	16
	L-3726	4800-6550	165	2.3 to 4.0	275	.90 to 1.9	0 to +3	—.90 to —3.4	1800	—20 to + 5	—100 to —700	—3 to +3	16
	L-3727	6500-8550	150	2.3 to 4.0	275	.90 to 1.9	0 to +3	—.90 to —3.4	1800	—20 to + 5	—100 to —700	—3 to +3	16
	L-3728	8500-11,000	150	2.3 to 4.0	275	.90 to 1.9	0 to +3	—.90 to —3.4	1800	—20 to + 5	—100 to —700	—3 to +3	16

Litton Industries' ruggedized, compact voltage tunable CW oscillators are designed for long reliable performance into a mismatch of 1.5:1 without discontinuities. A wide variety of uses include high power sweep oscillators, frequency modulated or amplitude modulated transmitters or as barrage counter-measures power sources. All are designed to operate at similar voltages and currents and have similar 3-bolt mounting dimensions for ease of installation. Tubes operating above 4.8 kMc are equipped with double ridge broadband waveguides and those below 4.8 kMc use 7/8" coaxial outputs. All have 6.3 volt filaments and are liquid cooled. Other types are in development.

CROSSED FIELD FORWARD WAVE AMPLIFIER TUBES

Z

Advanced engineering is now being conducted in the development of sophisticated crossed field amplifiers for pulse and CW applications at a variety of frequencies (S through Ku-band) and power levels. CFAs offer high average power, increased efficiency, high perveance, wide bandwidth, reduced phase shift with variation of operating voltage, and high gain; yet are small in size and weight.

Recent accomplishments in CFAs include an increase of CW power at Ku-band by an order of magnitude, the achievement of peak power outputs in the megawatt range at X-band with a stable linear amplifier, and a 1.0 kilowatt CW amplifier at X-band, which covers a 20% bandwidth. Gain has reached 27 db and 40 db will be achieved in the future. Several X-band tubes are now available.

BARRATRON® TRANSMITTING TUBES

Z_1

Litton Industries has developed a series of high power tubes which generate non-coherent white noise over broad bandwidths. Families of tubes from UHF through X-bands make possible more efficient, compact, reliable electronic counter-measures jamming equipment.

Lightweight BARRATRON® tubes are available in both fixed-tuned and tunable versions. The effectiveness of these tubes is the result of the quality of the white noise spread across a wide band.

Details are classified and made available on a "need-to-know" basis.


14 ft.
13 ft.
12 ft.
11 ft.
10 ft.
9 ft.
8 ft.
7 ft.
6 ft.
5 ft.
4 ft.
3 ft.
2 ft.
1 ft.
L-3707
L-3035
L-3735
L-3702
L-3250
L-3270
L-3403
L-3401
L-3647
1 ft.
2 ft.
3 ft.
4 ft.
5 ft.
6 ft.
7 ft.
8 ft.
9 ft.
10 ft.
11 ft.

KLYSTRONS

KLYSTRON AMPLIFIERS, PULSED, MODULATING ANODE, HOLLOW BEAM

Tube Type	Frequency Range (Mcs)	Tuning	Peak Power Output Minimum (Megawatts)	Average Power Output (Kilowatts)	Pulse Width Cathode (μ sec)	Band Width Minimum (Mcs)	Gain Minimum (db)	Typical Operating Values eb (kv)	ib (amps)	Mod. Anode Voltage Peak (kv)	Focus Coil Model
L-3847	1250-1350	Tunable	0.2	10	8		26	50	14	8	TBS
L-3707	1250-1350	Broadband	10	30	10	100	36	180	185	40	216

Other Hollow Beam Tubes Available.

KLYSTRON AMPLIFIERS, PULSED, MODULATING ANODE

Tube Type	Frequency Range (Mcs)	Tuning	Peak Power Output Minimum (Megawatts)	Average Power Output (Kilowatts)	Pulse Width Cathode (μ sec)	Band Width Minimum (Mcs)	Gain Minimum (db)	Typical Operating Values eb (kv)	ib (amps)	Mod. Anode Voltage Peak (kv)	Focus Coil Model
L-3403	400-450	Mechanical	1.25	75	2100		35	105	32.5	55	190
L-3694	400-450	Mechanical	1.25	75	2100	4*	35	108	35	55	190
L-3401	1254-1386	Mechanical	5	300	550		35	124	115	124	187
L-3739	1260-1320	Mechanical	0.2	50	2000		30	40	17	40	200

*To 1 db points.

KLYSTRON AMPLIFIERS, PULSED, BROADBAND

Tube Type	Frequency Range (Mcs)	Peak Power Output** (Megawatts)	Average Power Output (Kilowatts)	Bandwidth Minimum (Mcs)	Pulse Width Cathode (μ sec)	Gain Minimum (db)	Typical Operating Values eb (kv)	ib (amps)	Focus Coil Model
L-3823	1200-1300	30	30	100	15	36	280	324	272
L-3270	1250-1350	2	4	100	8	30	115	93	156
L-3303	1250-1350	5	20	100	23	32	145	139	166
L-3323	1250-1350	10	20	100	10	36	170	174	56
L-3702	1250-1350	30	150	100	30	33	280	324	203
L-3735	2750-2850	5	18	100	12	50	140	119	215
L-3647	2750-2850	5	50	100	30	33	140	119	200
L-3742	S-band	Classified	Classified	4%	10	35	Classified		288

**Minimum over indicated bandwidth.

KLYSTRON AMPLIFIERS, PULSED-TUNABLE

Tube Type	Frequency Range (Mcs)	Peak Power Output Minimum (Megawatts)	Average Power Output (Kilowatts)	Pulse Width Cathode (μ sec)	Gain Minimum (db)	Typical Operating Values eb (kv)	ib (amps)	Focus Coil Model
L-3775	405-445	30	30	15	36	242	357	271
L-3486	1250-1380	0.25	17	40	30	45	18.5	201377
L-3035	1240-1360	2.2	7.6	8	36	115	78	201377
L-3257	1250-1350	4	1.3	34	29	130	95	46 or 204
L-3227	1250-1350	5	10	7	30	136	100	46 or 204
L-3250	1250-1350	10	15	7	36	185	160	46
L-3355	1250-1350	20	30	7	36	230	220	46
L-3531	1250-1350	25	82	8	36	240	290	46
L-3387	1250-1350	30	100	6	36	270	280	46 (modified)

KLYSTRON AMPLIFIERS, PULSED-FIXED TUNED

Tube Type	Frequency Range (Mcs)	Peak Power Output Minimum (Megawatts)	Average Power Output (Kilowatts)	Pulse Width Cathode (μ sec)	Gain Minimum (db)	Typical Operating Values eb (kv)	ib (amps)	Focus Coil Model
L-3660	1295-1305***	10	20	32	33	175	171	200
L-3661	1250-1350***	20	30	8	36	240	234	200
L-3530	1250-1350***	25	82	8	40	240	290	200
L-3843	2855	5	15	30	40	148	112	200
L-3768	2855	10	20	30	40	185	160	200
L-3618	2855	24	24	3.2	50	250	250	TBS

***Fixed tuned to a point within this range.

KLYSTRON AMPLIFIERS, CW.

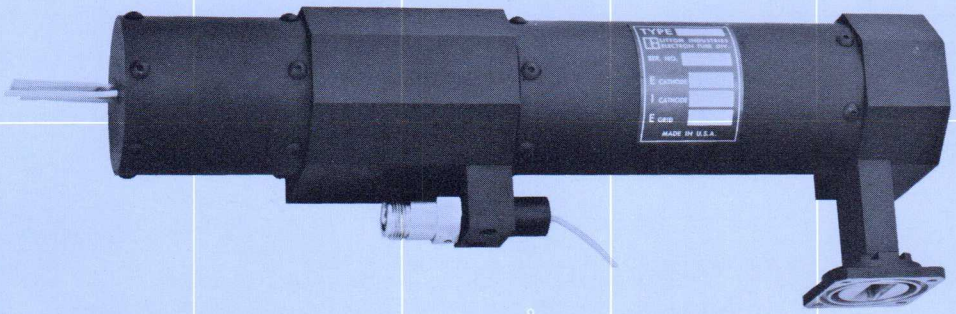
Tube Type	Frequency Range (Mcs)	Tuning	Gun Type	Power Output (Kilowatts)	Focus Coil Model
L-3739	1260-1320	Mechanical	Mod. Anode	50	200

Direct inquiries are invited concerning other tube types in the field of continuous wave klystrons.

12 in.

L-3769

9 in.



L-3815

6 in.

L-3472

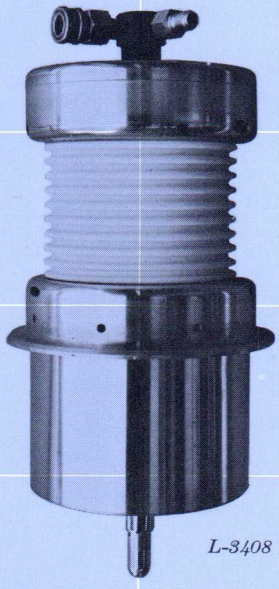
3 in.

3 in. 6 in. 9 in. 12 in. 15 in. 18 in. 21 in.

30 in.

24 in.

18 in.



L-3408

12 in.

L-3620

6 in.

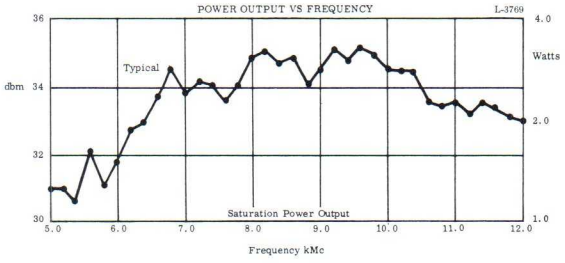
6 in. 12 in. 18 in. 24 in. 30 in. 36 in. 42 in. 48 in.

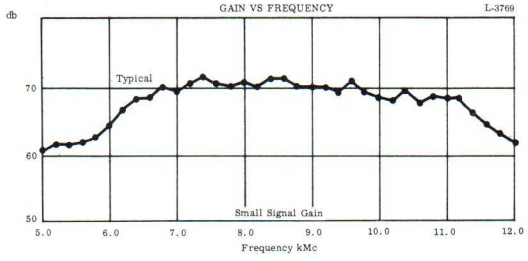
TRAVELING WAVE TUBES

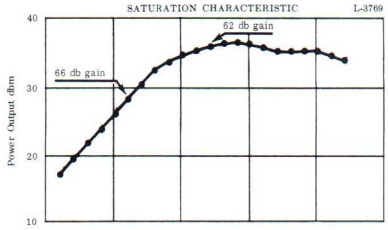
Lightweight, compact, highly reliable, Litton Industries' traveling wave tubes have been designed and produced for high CW power and wide bandwidth. The majority of TWTs listed here are PPM focused; all meet a variety of applications. Special helix design and fabrication techniques have raised the saturation gain to within 3 db of small signal gain. These tubes can be supplied with small signal gains up to 70 db and with linear power characteristics similar to the L-3769 shown on these pages. Input and output circuits are coaxial, providing minimum frequency sensitivity. Because of this, usable bandwidth is limited only by the electronic bandwidth of the beam and circuit combination. These all metal and ceramic, ruggedized TWTs, weighing between 1.5 and 6.0 pounds, meet military environmental specifications, Class II. The engineering staff is prepared to design TWTs to meet your requirements.

Tube Type	Frequency Range Mcs	Minimum Power Output	Small Signal Gain Minimum	Duty Factor	Cooling
L-3674	400-450	2.5 Kilowatts	37 db	.06	Liquid
*L-3844**	400-450	10 Kilowatts	37 db	.001	Liquid
L-3499	2000-4000	2 Watts	36 db	CW	Conduction
L-3663	2000-4000	10 Watts	33 db	CW	Conduction and Forced Air
L-3470	4000-8000	20 Milliwatts	36 db	CW	None
L-3711	4000-8000	1 Watt	36 db	CW	Conduction
L-3471	4000-8000	2 Watts	36 db	CW	Conduction
L-3763	5000-6000	2 Watts	60 db	CW	Conduction
L-3657	4000-8000	10 Watts	33 db	CW	Conduction and Forced Air
L-3611	7000-11,000	20 Milliwatts	36 db	CW	None
L-3769	5400-11,000	1 Watt	60 db	CW	Conduction
L-3612	7000-11,000	2 Watts	36 db	CW	Conduction
L-3472	7000-11,000	10 Watts	36 db	CW	Conduction and Forced Air
L-3815	8000-10,000	200 Watts	36 db	.01	Conduction

*In Development







HIGH VOLTAGE SWITCH TUBES

New Litton Industries' INJECTRON® switch tubes vastly extend the voltage operating range of hard tube pulse circuitry. Through an advanced concept for high power beam switching, a series of Litton high voltage, medium current switch tubes are now available, which feature 95% switching efficiency and fast rise times at low control power levels. These rugged metal and ceramic tubes offer extremely high hold-off voltage, low voltage drop at the operating current, high plate dissipation, and pentode-like constant current characteristics over a broad operating range.

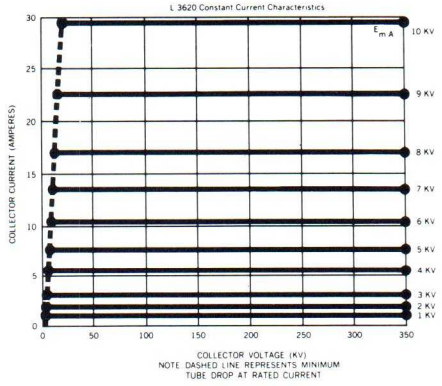
Tube Type	Collector Voltage kVdc	Collector Current Amps	Application
L-3408	150	20	Floating Deck
L-3822	150	30	Floating Deck
L-3734	200	200	Series Switch
L-3620	350	30	Floating Deck

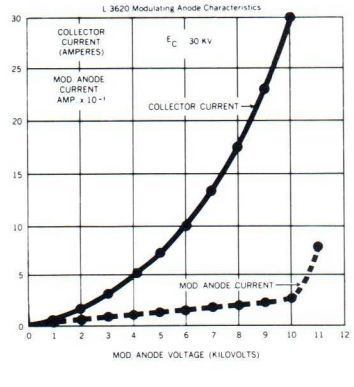
TYPICAL OPERATION CHARACTERISTICS-L-3620 SWITCH TUBE

The L-3620 high vacuum switch tube has been designed for use in high voltage, high switch rate, floating deck modulator applications.

Tentative Specifications	
Collector Voltage	Max. 350 kVdc
Collector Current, peak	30 a
Collector Dissipation	Max. 35 kw
Pulse Length	
Ic = 1.0 Amp	10 ms
Ic = 30 Amps	30 μs
Energy/Pulse	Max. 50 joules
Modulating Anode Voltage at	
Ic = 1.0 Amp	Max. 2.0 kv
Ic = 30 Amps	Max. 12 kv
Modulating Anode Current*	Max. 300 ma
Modulating Anode Bias	Max. 1000 v
Capacity (Mod. Anode to all electrodes)	Nom. 50 pf
Heater Voltage	12 V
Heater Current	6 ± 0.5 A
Mechanical Description	
Length	30 in.
Diameter, including magnets	15 in.
Weight, including magnets	250 lb.
Cooling	Liquid

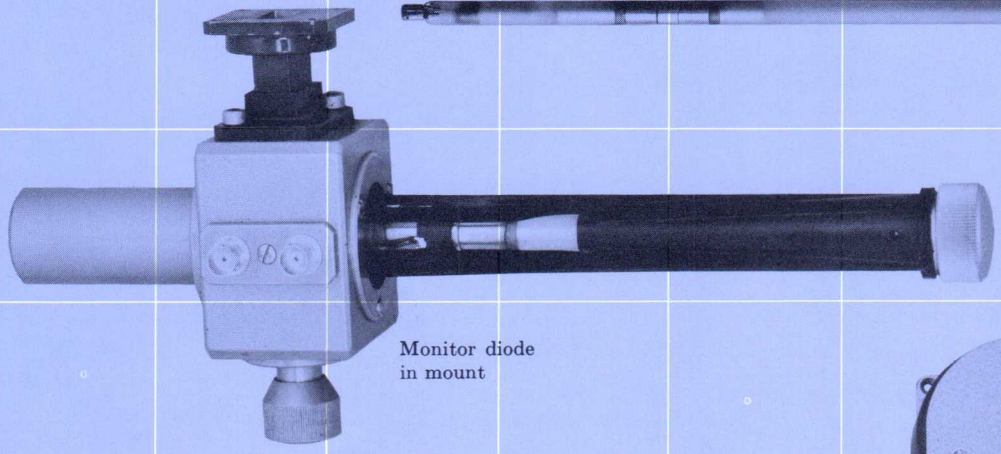
*at Ic = 30 Amps / Ec ≥ 25 kv



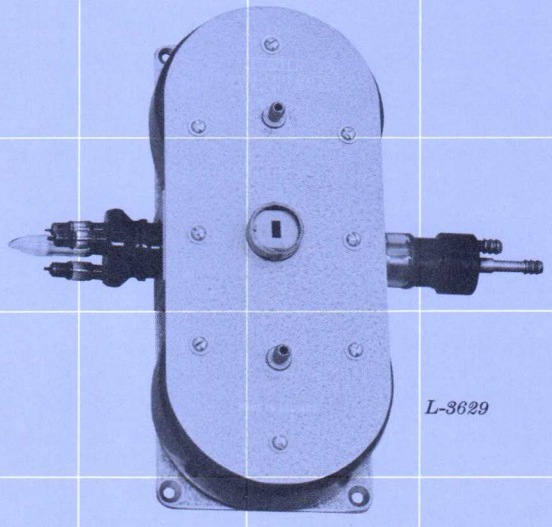


L-2060

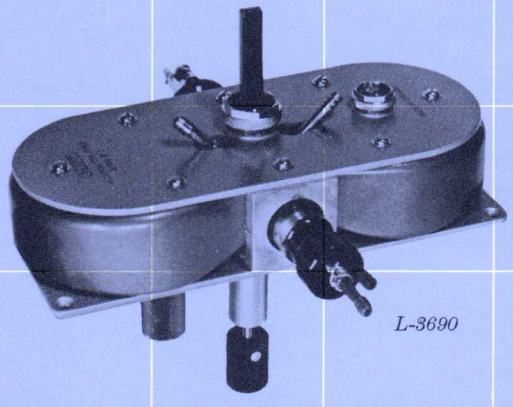
L-2061



Monitor diode
in mount



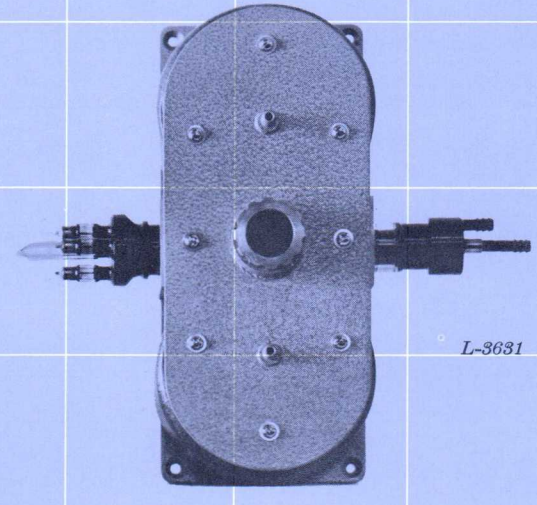
L-3629



L-3690

L-3692

L-3710



L-3631

36 in.
33 in.
30 in.
27 in.
24 in.
21 in.
18 in.
15 in.
12 in.
9 in.
6 in.

3 in. 6 in. 9 in. 12 in. 15 in. 18 in. 21 in. 24 in.

MILLIMETER WAVE TUBES

These Elliott-Litton, Ltd. products are available through the Litton Industries Electron Tube Division, San Carlos.

MONITOR DIODES

Monitor diodes take the form of a length of evacuated coaxial line, which is designed to terminate in a dissipative load. It has a central indirectly heated electrode which is the emitter, and an outer conductor which is the collector. Microwave energy fed into the line interacts with the electron space charge and induces an electron flow from the cathode to the collector. A potential difference will be developed across an external load resistor connected between the electrodes, and this induced potential difference will depend on the instantaneous microwave power level in the diode.

Applications include the continuous monitoring of rf power, the observation of irregularities in magnetron performance and the direct viewing of rf power pulse envelopes. These tubes may also be used to control the output of M-type backward wave oscillators at a power level approximately one watt. For this application, the diode load should be in order of 10,000 ohms.

Tube Type*	Frequency Range Gc	Peak Power Input kw	Average Power Input W	Heater Voltage v
L-2060 (30MD1)	8.5-10	20	18	6.3
L-2061 (100MD1)	2.7-3.5	20	18	6.3
L-2062 (8MD3)	34.5-36	10	15	3.0

FLOATING DRIFT TUBE KLYSTRON OSCILLATORS

Tube Type*	Frequency Range Gc	Tuning Range Minimum Mc	Power Output Watts (minimum except where stated otherwise)	Maximum Cavity Potential With Respect to the Cathode kVdc	Maximum Cathode Current mA	Cooling
L-3638 (4FK1)	74 ± 6	Fixed	0.1	4.0	150	Liquid
L-3639 (4FK2)	74 ± 6	Fixed	0.5	4.0	150	Liquid
L-3689 (4FK3)	74 ± 6	1500	0.5 (nominal)	4.0	150	Liquid
L-3690 (4TFK4)	74 ± 6	1500	0.1	4.0	150	Liquid
L-3691 (4TFK5)	74 ± 6	1500	0.1 (nominal)	4.0	150	Liquid
L-3640 (6FK1)	50 ± 2	Fixed	1.0	4.0	150	Liquid
L-3693 (6TFK2)	50 ± 2	1500	1.0	4.0	150	Liquid
L-3629 (8FK1)	35 ± 2	Fixed	15.0	4.0	150	Liquid
L-3628 (8TFK2)	35 ± 2	1600	10.0	4.0	150	Liquid
L-3659 (8TFK9)	35 ± 2	700	5.0	4.0	150	Liquid
L-3713 (8FK13)	35 ± 1	Fixed	30.0	6.0	150	Liquid and Air
L-3736 (8FK15)	35 ± 1	Fixed	50.0	6.0	150	Liquid and Air
L-3630 (12FK1)	23 ± 2	Fixed	10.0	4.0	150	Liquid
L-3631 (12TFK2)	23 ± 2	1000	8.0	4.0	150	Liquid

Elliott-Litton floating drift tube construction gives the effect of a single cavity tube with the working efficiency of a two cavity klystron. Special advantages are freedom from hysteresis and an increase in operation stability. Low noise characteristics and improved cathode durability result in long life and reliability.

REFLEX KLYSTRONS

Tube Type*	Frequency Range Gc	Minimum Tuning Range Mc	Power Output Watts (minimum)	Maximum Cavity Potential With Respect to Cathode kVdc	Maximum Cathode Current mA	Cooling
L-3632 (8RK4)	35 ± 2	1000	0.03	2.5	15	Air
L-3633 (8RK8)	35 ± 2	1000	0.20	2.6	25	Air
L-3710 (8RK13)	35 ± 2	2000	0.03	2.3	15	Air
L-3642 (12RK3)	23 ± 2	500	0.10	3.5	30	Air
L-3692 (12RK4)	21 ± 3	500	0.35	3.5	30	Air

These rugged, air cooled, tunable power sources feature high softening point alumina silicate glass sealed to molybdenum in the envelope construction. This allows the tube to be processed at 700°C and enables an extremely high vacuum to be obtained.

CW TRAVELING WAVE TUBE AMPLIFIER

Tube Type*	Frequency Range Gc	Power Output W	Gain	Cooling
L-3634 (30TWA1)	9.1-9.5	1000 (nominal)	10 db (1000 W)	Liquid and Air

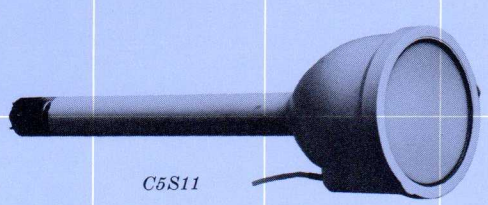
This CW traveling wave tube has a clover leaf slow wave structure with no attenuator or sever, stability being assured by a ferrite isolator in the input waveguide. It may be tuned over a five per cent range of frequencies by varying the beam voltage.

MAGNETRONS See page 17, sections T and U.

*Brackets indicate former number.

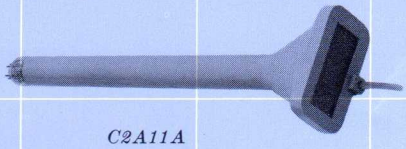
Millimeter wave tube power supplies, as well as monitor diode tube mounts and waveguide mounts, are also available.

Litton Industries, Electron Tube Division, San Carlos, California



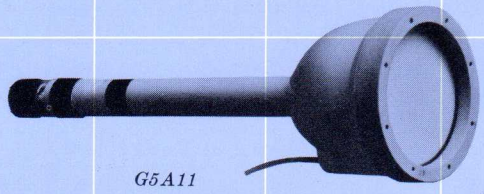
C5S11

C1E11

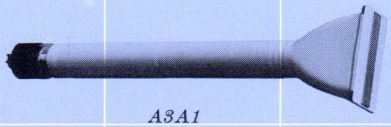


C2A11A

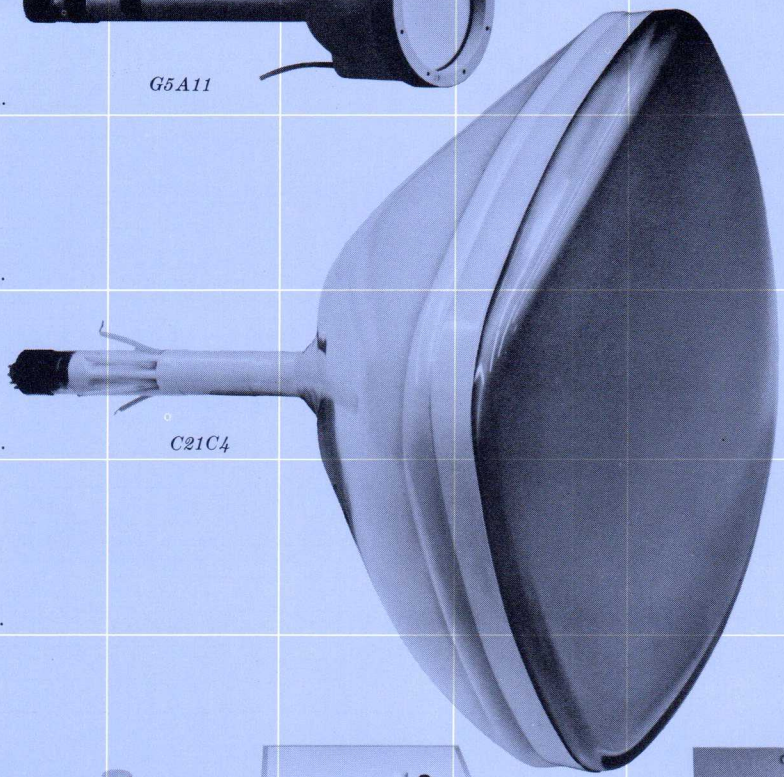
E2A16



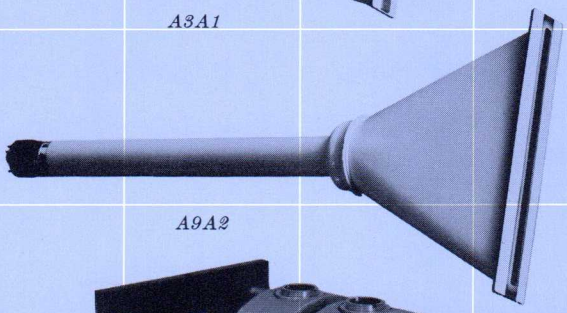
G5A11



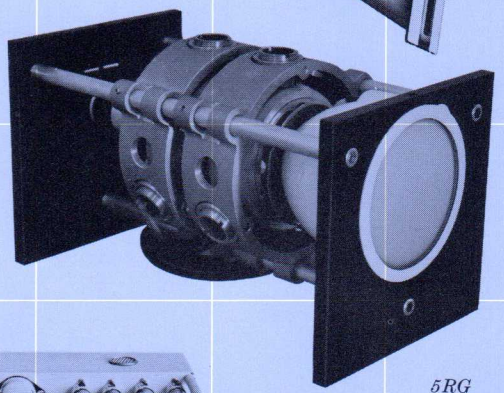
A3A1



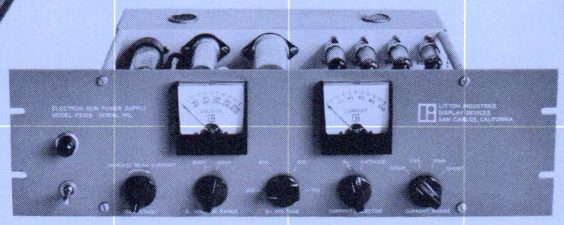
C21C4



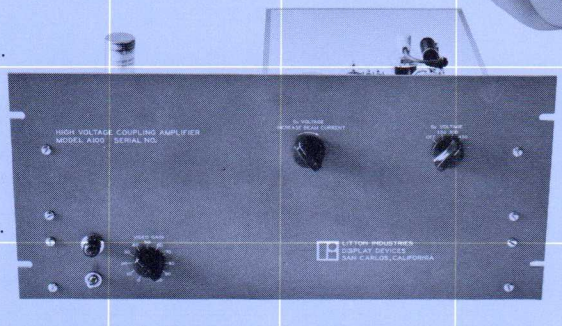
A9A2



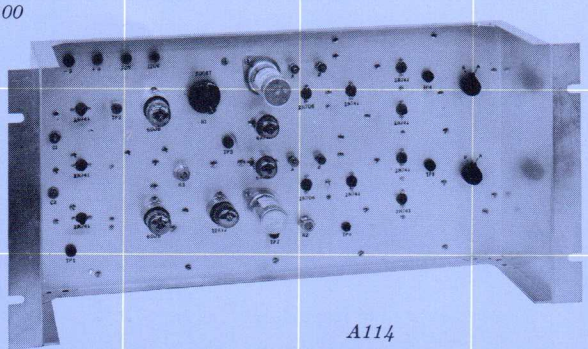
5RG



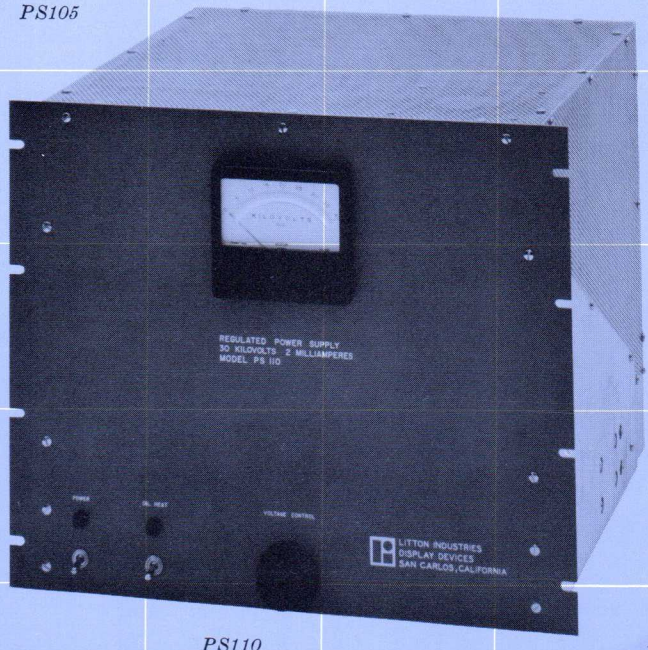
PS105



A100



A114



PS110

PM101

6 in. 12 in. 18 in. 24 in. 30 in. 36 in. 42 in. 48 in.

DISPLAY DEVICES

CATHODE RAY TUBES

These tubes represent a cross-section of the types and varieties of precision, high performance cathode ray tubes available from the Display Devices Department. Variations of these tubes and other special purpose tubes are available upon request.

A3A1	1000 element per inch line scan PRINTAPIX® for high definition reproduction. Printing widths up to 11″ available.
A9A2	8½″ PRINTAPIX® CRT for high speed facsimile reproduction of documentary and half tone copy. One of the PRINTAPIX® family. Others available in 2¾″, 5″ and 11″ printing widths.
B3C2	2¾″ PRINTAPIX® CRT with supplementary electrostatic deflection plates for high speed direct printing of alpha-numeric symbols.
C1E11	1″ ruggedized CRT. Conventional face plate version of E1E11.
C2A11A	Miniature 2″ rectangular high resolution CRT for minimum volume high performance applications.
C3A1	3″ rectangular MICROPIX® for use as a PRINTAPIX® set-up tube and for other applications.
C5A11	5″ multi-purpose MICROPIX® CRT for use in all high performance applications requiring high resolution. Line widths of 0.0006 inches available. All common phosphors available.
C5A16	Version of the C5A11, applicable for high resolution flying spot scanning systems.
C5C16	5″ dual deflection COMPOSIPIX® high definition character writing CRT with full range of phosphors available. 4000 line resolution. Electrostatic deflection for character writing; magnetic deflection for character positioning.
C5S11	Ultra-high resolution MICROPIX®, featuring improved electron gun for 0.0004 line width. Also, C5S16 for flying spot scanning.
C7A11	7″ general purpose high resolution CRT. Also, C7A16 for flying spot scanning.
C10T7	10″ low drive (12 volt video) version of the 10KP7A for transistor operation. Mechanically and electrically interchangeable with the 10KP7A.
C14A4	14″ rectangular CRT used for high resolution monitoring.
C21A4	5000 line 21″ rectangular glass tube with metallized screen.
C21C4	Dual deflection 21″ rectangular CRT featuring electrostatic deflection plates for high speed character generation.
E1E11	1″ Fiber Optic CRT which has precision array of 32 x 32 light conducting fibers for direct film recording of digital information. Electrically interchangeable with the 1DP11.
E2A16	1½″ Fiber Optic high resolution CRT for direct film recording. One of a family of Fiber Optic tubes.
G5A11	Ruggedized, precision mount, aligned beam 5″ special purpose MICROPIX® CRT for airborne applications in photographic recording.
K1E32	Beam switching tube with 1024 selectable outputs from analog or digital input.
PX275	Low cost PRINTAPIX® for experimental work.

CRT OPERATIONAL ACCESSORIES

The listed equipments result from years of experience by the Display Systems Group of the Display Devices Department with the operation and testing of high performance CRTs. They are provided as accessories to enable the user to achieve maximum performance from CRTs. Special designs for unusual applications will be provided upon request.

A100	High Voltage Coupling Amplifier which provides CRT metering, all electron gun static voltages, video signal amplification and isolation with bandpass of 10 cps to 4.5 Mc for CRTs operating with depressed cathode.
A106	Video Amplifier and Electron Gun Supply for magnetically deflected and focused CRTs. Five Mc video bandwidth.
A107	Same as A100, except bandpass from 10 cycles to 12 Mc.
A108	Dynamic Focus Correction Amplifier for magnetically focused display systems.
A111	Same as A106, with extended range to 12 Mc.
A112	Twelve Channel Video Distribution Amplifier, 10 cps to 12 Mc bandwidth for TV signal distribution from a central point.
A113	Fifteen Channel Synchronization Signal Distribution Amplifier for TV-type sync signal distribution from a central point.
A114	Aperture Correction Amplifier which compensates for high frequency loss in high resolution flying spot scanner systems.
PM101	Multiplier Phototube, Preamplifier and Power Supply Sub-system for flying spot scanner applications.
PS101	Universal Current Regulated Focus Supply for use with appropriate focus coil on any magnetically focused CRT. Unit has provision for introduction of low frequency dynamic focus correction.
PS102	Universal High Voltage Power Supply for CRT operation. RF type supply with 0 to 30 kv at 1.0 ma output, one-half per cent regulation and low ripple. For use with CRTs requiring grounded anode operation.
PS103	Same as PS102 except the output voltage is positive for conventional operation of CRTs.
PS105	Universal Electron Gun Power Supply which provides static voltages to the electron gun of magnetically focused CRTs.
PS107	Forty Kilovolt Negative Output Heavy Duty High Voltage Power Supply for grounded anode operation of CRT displays.
PS110	Heavy Duty High Voltage Power Supply with positive output 30 kv.
RG100	Universal Raster Generator for TV standards, which furnishes high quality raster for all magnetically deflected CRTs up to 90° and 27.5 kv.
S103	Flying Spot Scanner Optical Assembly for mounting CRT, optics, subject and light pick-up in correct relation.
SY101	Universal Synchronization Generator featuring 14 outputs for sync, blanking and other signals for a variety of TV type scan rates.
5RG	Tube Mount for all 5″ MICROPIX® tubes. Unit includes adjustable mounts for deflection and focus components, permitting precision positioning.

13 ft.

12 ft.

11 ft.

10 ft.

9 ft.

8 ft.

7 ft.

6 ft.

5 ft.

4 ft.

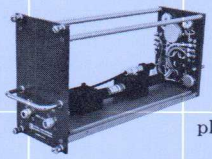
3 ft.

2 ft.

Socket

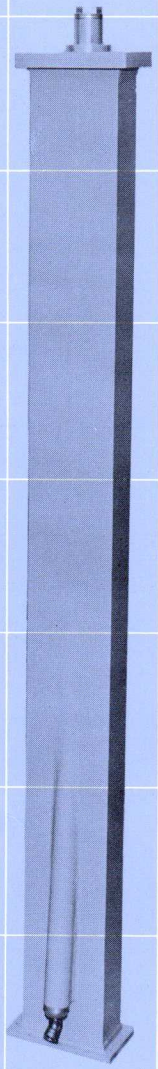
WL-54

211

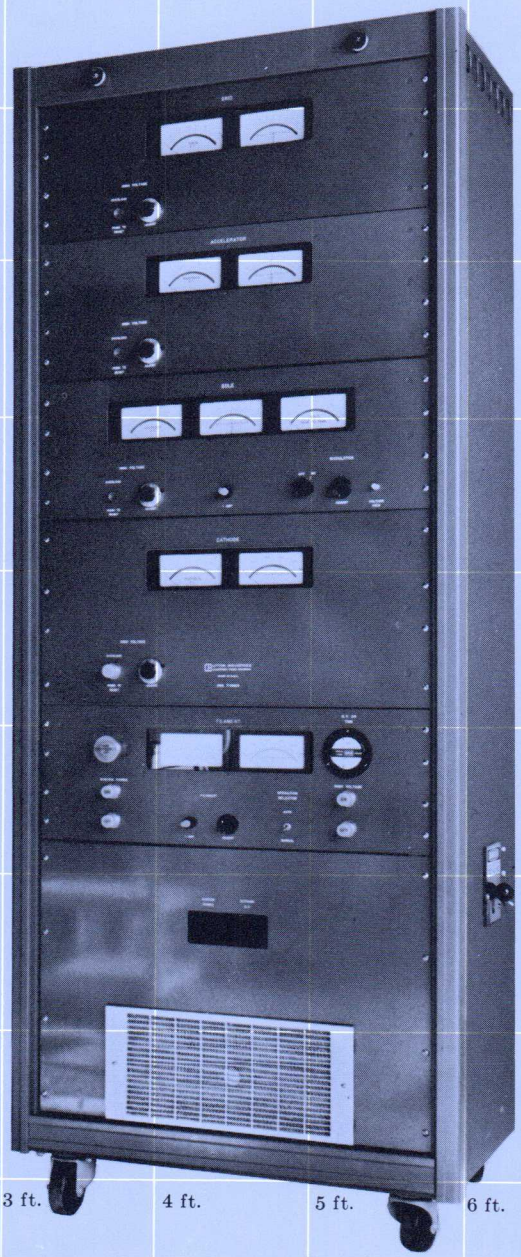


211
plug-in

218

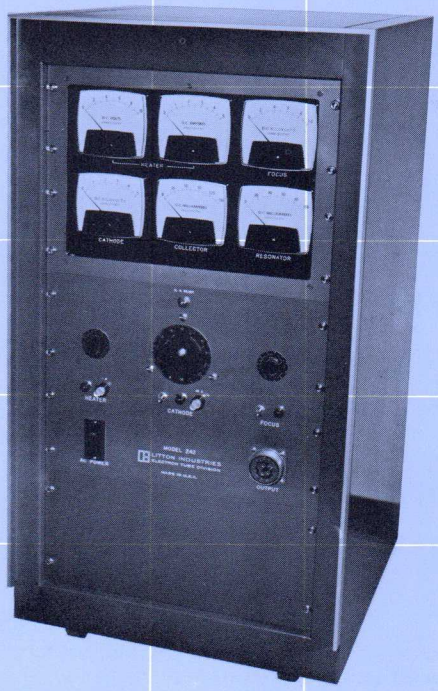


WL-82



219

231



242

1 ft. 2 ft. 3 ft. 4 ft. 5 ft. 6 ft. 7 ft. 8 ft. 9 ft.

EQUIPMENT—ACCESSORIES

WATER LOADS

Model Number	Frequency Mcs	Power Peak Mw	Power Average Kw	VSWR	Waveguide Gas Pressure	Input Water Pressure	RF Connection	Water Connection	Length	Weight Lbs.
WL-54	1300±5%	10	20	1.15:1	50 psia	100 psi	CPR-650F	½″ NPT	4′2″	35
WL-82	1120-1700	30	100	1.15:1	50 psia	100 psi	CPR-650F	½″ NPT	6′6″	50
WL-88	1120-1700	10	300	1.05:1	50 psia	100 psi	CPR-650F	1″ NPT	7′6″	60
WL-209	2700-2900	10	20	1.15:1	30 psia	100 psi	UG-553/U	½″ NPT	5′1″	100
WL-210	400-450	2.3	150	1.2:1*	0 psig	150 psi	CPR-2100	1½″ NPT	28′	250
WL-246	490-610	5.0	300	1.1:1*	0 psig	150 psi	CPR-1800	1½″ NPT	22′	220

*VSWR measured with circulating fluid composed of 9 parts of ethylene glycol to 1 part of water.

TWT AMPLIFIERS

Model Number	Frequency Range Gc	Power Output Watts	Remarks
211 Basic Unit	2.0 to 11	1, 2, 10	Plug-in rf units include TWTs. Require Basic Model 211 Power Supply.

NOTE: Please refer to Traveling Wave Tube section to determine various powers and frequency ranges available as plug-in units.

MICROWAVE RF POWER SOURCES

Model Number	Power Tube Type	Frequency** Mc	Modes of Operation	RF Power**
217	Air Cooled CW/Pulse Magnetrons	975 to 10,475	CW, MCW, Pulse and Square Wave	Variable to 110W Ave., 900W Peak
218	Liquid Cooled CW/ Pulse Magnetrons	350 to 10,475	CW, MCW, Pulse and Square Wave	Variable to 500W Ave., 2.0 Kw Peak
219	M-Type Backward Wave Oscillators	1000 to 11,000	CW, MCW, FM, Pulse	Variable to 200W, peak or average
221	CW Magnetron MICROTRON®	2450	CW only	Variable to 1.0 Kw
258	Floating Drift Tube Klystrons	21,000 to 25,000 30,000 to 37,000 48,000 to 52,000 68,000 to 80,000	CW, Pulse and Square Wave	Variable to 50W, peak or average
269	Air Cooled CW/Pulse Magnetrons	975 to 10,475	CW only	Variable to 110W
270	Air Cooled CW/Pulse Magnetrons	975 to 10,475	CW and 1.0 Kc Square Wave	Variable to 110W Ave., 450W Peak
3653	Liquid Cooled CW/ Pulse Magnetrons	350 to 10,475	CW, MCW	Variable to 500W

**Frequency and power depend upon specific tube number selected.

FOCUS COIL POWER SUPPLIES

Model Number	DC Voltage	DC Current	Regulation	Ripple	Interlock	Remarks
222	0-250	0-15 A		2.0% rms Load Z>8Ω	Low Current Relay	208/230V, 3 phase input. Across-the-line type rectifier.
231	0-250	0-15 A	1.0% ±10% line and ±15% load variation	2.0% rms Load Z>8Ω	Low Current Relay	208/230V, 3-phase input. Magnetic amplifier type.
276	0-80	0-20 A	2.0% ±10% line and ±25% load variation	1.0% rms Load Z>2Ω	Low Current Relay Power on Relay	105-130V single phase input. SCR Type. Isolated.

FLOATING DRIFT TUBE KLYSTRON POWER SUPPLIES

Model Number	Beam Supply	Focus Electrode	Filament	Remarks
242	0-5000 Vdc 150 mA, ripple 1.0% rms	0-1000 Vdc, 10 mA; ripple 0.05% rms	0-10 Vdc 5.0 A max.; ripple 2% rms	Will operate all Elliott-Litton FDT Klystrons with 15W rf output or less.
242A	0-6000 Vdc 200 mA, ripple 1.0% rms	0-1000 Vdc, 10 mA; ripple 0.05% rms	0-10 Vdc 5.0 A max.; ripple 2% rms	Will operate all Elliott-Litton FDT Klystrons.
261	3.0 to 6.5 kVdc 200 mA, ripple 0.1% rms	500 to 1000 Vdc, 10 mA; ripple 0.05% rms	5.0-10 Vdc 4.0 A max.; ripple 0.5% rms	Electronically regulated for improved power and frequency stability. Will operate all Elliott-Litton FDT Klystrons.

NOTE: Available as an accessory—Model 260 Heat Exchanger. Will mount in any of the above mentioned cabinets.

OTHER ACCESSORY EQUIPMENTS:

In addition to the equipment listed above, Litton Industries designs and manufactures custom focusing coils, differential thermopiles, radiation shields, transitions, sockets, filament controllers and other tube-related equipment.

Litton custom designs focus coils for traveling wave tubes, klystrons, parametric amplifiers, magnetic beam switching and laboratory use. Research projects including superconductive electro-magnetic products are presently in process.

Differential thermopiles are manufactured for calorimetric measurement of power dissipation in high power tubes and rf water loads.

X-radiation shields have been designed for use in klystron transmitting systems. Standard models may be retrofitted for new systems or, when necessary, new shields will be designed.

MICROWAVE TUBE CROSS REFERENCE BY CENTER FREQUENCY

Tube Number	Tube Type	Center Frequency	Power Output	Frequency Range	Page No.
L-3674	TWT	425	2.5 KW	400—450	23
L-3824•	TWT	425	10 KW	400—450	23
L-3403	Kly.	425	1.25 MW	400—450	21
L-3694	Kly.	425	1.25 MW	400—450	21
L-3775•	Kly.	425	30 MW	405—445	21
L-3455	Mag.	428	2.0 MW	406—450	17
L-3456•	CW Mag.	470	165 KW	350—590	19
L-3714	Mag.	600	165 W	475—725	19
L-3459•	CW Mag.	782	165 W	590—975	19
L-3721	MBWO	1200	200 W	1000—1400	19
L-3502	Mag.	1237	110 W	975—1500	19
L-3465	Mag.	1237	400 W	975—1500	19
L-3823•	Kly.	1250	30 MW	1200—1300	21
L-3739•	Kly.	1290	0.2 MW	1260—1320	21
L-3847•	Kly.	1300	.20 MW	1250—1350	21
L-3270	Kly.	1300	2.0 MW	1250—1350	21
L-3035	Kly.	1300	2.2 MW	1240—1360	21
L-3257	Kly.	1300	4.0 MW	1250—1350	21
L-3303	Kly.	1300	5.0 MW	1250—1350	21
L-3227	Kly.	1300	5.0 MW	1250—1350	21
L-3250	Kly.	1300	10 MW	1250—1350	21
L-3707•	Kly.	1300	10 MW	1250—1350	21
L-3323	Kly.	1300	10 MW	1250—1350	21
L-3660	Kly.	1300	10 MW	1295—1305	21
L-3355	Kly.	1300	20 MW	1250—1350	21
L-3661	Kly.	1300	20 MW	1250—1350	21
L-3530	Kly.	1300	25 MW	1250—1350	21
L-3531	Kly.	1300	25 MW	1250—1350	21
L-3387	Kly.	1300	30 MW	1250—1350	21
L-3702	Kly.	1300	30 MW	1250—1350	21
L-3486	Kly.	1315	.251 MW	1250—1380	21
L-3401	Kly.	1320	5.0 MW	1254—1386	21
L-3503	Mag.	1925	110 W	1500—2350	19
L-3464	Mag.	1925	400 W	1500—2350	19
L-3510	Mag.	2450	1000 W	2450	19
L-3647	Kly.	2800	5.0 MW	2750—2850	21
L-3735•	Kly.	2800	5.0 MW	2750—2850	21
L-3843•	Kly.	2855	5.0 MW	2855	21
L-3768•	Kly.	2855	10 MW	2855	21
L-3618	Kly.	2855	24 MW	2855	21
L-3504	Mag.	2962	110 W	2350—3575	19
L-3460	Mag.	2962	500 W	2350—3575	19
L-3499	TWT	3000	2.0 W	2000—4000	23
L-3663	TWT	3000	10 W	2000—4000	23
L-3724	MBWO	3025	180 W	2500—3550	19
L-2061	M.D.	3150	20 KW	2700—3500	25
L-3725•	MBWO	4175	180 W	3500—4850	19
L-3505	Mag.	4275	110 W	3575—4975	19
L-3461	Mag.	4275	350 W	3575—4975	19
L-3763•	TWT	5500	2.0 W	5000—6000	23
L-3506	Mag.	5575	110 W	4975—6175	19
L-3467	Mag.	5575	400 W	4975—6175	19
6344A	Mag.	5637	175 KW	5450—5825	17
7156	Mag.	5637	250 KW	5450—5825	17
L-3726	MBWO	5675	165 W	4800—6550	19
L-3470	TWT	6000	20 mW	4000—8000	23
L-3711	TWT	6000	1.0 W	4000—8000	23
L-3471	TWT	6000	2.0 W	4000—8000	23
L-3657	TWT	6000	10 W	4000—8000	23
L-3507	Mag.	6725	110 W	6175—7275	19
L-3468	Mag.	6725	300 W	6175—7275	19
L-3727•	MBWO	7525	150 W	6500—8550	19
L-3508	Mag.	8025	110 W	7275—8775	19
L-3462	Mag.	8025	300 W	7275—8775	19
L-3769•	TWT	8200	1.0 W	5400—11,000	23
L-3820•	Mag.	8500	10 KW	8500 ±300	15
L-3602	Mag.	8600	0.03 KW	8600 ±40	15
L-3039R	Mag.	8790	225 KW	8790 ±90	17
L-3089	Mag.	8800	0.04 KW	8800 ±25	15
L-3039D	Mag.	8800	225 KW	8800 ±20	17
L-3039E	Mag.	8860	225 KW	8860 ±20	17
L-3039F	Mag.	8920	225 KW	8920 ±20	17
L-3039G	Mag.	8980	225 KW	8980 ±20	17
L-3611	TWT	9000	20 mW	7000—11000	23
L-3612	TWT	9000	2.0 W	7000—11000	23
L-3472	TWT	9000	10 W	7000—11000	23
L-3815•	TWT	9000	200 W	8000—10000	23
L-3030B	Mag.	9000	300 KW	9000 ±30	17
L-3212	Mag.	9010	0.12 KW	9000—9020	15
L-3039H	Mag.	9040	225 KW	9040 ±20	17
L-3103	Mag.	9050	30 KW	8500—9600	17
6543	Mag.	9050	65 KW	8500—9600	17
6543A	Mag.	9050	65 KW	8500—9600	17
L-3213	Mag.	9060	0.12 KW	9050—9070	15
L-3039I	Mag.	9100	225 KW	9100 ±20	17
L-3214	Mag.	9110	0.12 KW	9100—9120	15
L-3379	Mag.	9150	1.0 KW	8800—9500	15
L-3380	Mag.	9150	2.0 KW	8800—9500	15
L-3381	Mag.	9150	3.0 KW	8800—9500	15
L-3382	Mag.	9150	4.0 KW	8800—9500	15
L-3218	Mag.	9160	0.12 KW	9150—9170	15
L-3039J	Mag.	9160	225 KW	9160 ±20	17
L-3226	Mag.	9190	0.12 KW	9180—9200	15
L-3030C	Mag.	9200	300 KW	9200 ±30	17
L-3180	TWT	9300	10 KW	9100—9500	25
L-3039K	Mag.	9210	0.12 KW	9200—9220	15
L-3036F	Mag.	9220	225 KW	9220 ±20	17
L-2060	Mag.	9245	65 KW	9245 ±30	17
L-3181	M.D.	9250	20 KW	8500—10000	25
L-3187	Mag.	9260	0.12 KW	9250—9270	15
L-3029A	Mag.	9260	0.12 KW	9250—9270	15
L-3036B	Mag.	9267	7.0 KW	9235—9300	15
L-3039L	Mag.	9275	65 KW	9275 ±15	17
L-3029B	Mag.	9280	225 KW	9280 ±20	17
L-3029D	Mag.	9288	7.0 KW	9250—9315	15
L-3105	Mag.	9298	7.0 KW	9265—9330	15
L-3087A	Mag.	9300	0.10 KW	9300 ±40	15
L-3603	Mag.	9300	0.12 KW	9280—9320	15
L-3634	Mag.	9300	0.5 KW	9300 ±30	15
L-3384	Mag.	9300	1.0 KW	9280—9320	15
L-3429	Mag.	9300	1.0 KW	9300 ±30	15
L-3604	Mag.	9300	1.0 KW	9300 ±30	15
L-3239	Mag.	9300	2.0 KW	9300 ±30	15
L-3605	Mag.	9300	3.0 KW	9300 ±30	15
L-3268	Mag.	9300	4.0 KW	9300 ±30	15
L-3812•	Mag.	9300	1.0 KW	9300 ±30	15
L-3813•	Mag.	9300	0.5 KW	9300 ±30	15
L-3028D	Mag.	9305	0.12 KW	9280—9330	15
L-3058	Mag.	9310	1.0 KW	9300—9320	15
L-3023	Mag.	9313	7.0 KW	9280—9345	15
L-3601	Mag.	9327	0.12 KW	9315—9340	15
L-3029C	Mag.	9328	7.0 KW	9295—9360	15
L-3225	Mag.	9330	1.0 KW	9310—9350	15
L-3238	Mag.	9340	1.0 KW	9340 ±30	15
L-3039M	Mag.	9340	225 KW	9340 ±20	17
L-3327	Mag.	9375	0.12 KW	9365—9385	15
L-3635	Mag.	9375	10 KW	9375 ±30	15
L-3431	Mag.	9375	18 KW	9375 ±30	15
L-3469	Mag.	9375	20 KW	9375 ±30	15
L-3654	Mag.	9375	24 KW	9375 ±30	15
L-3168	Mag.	9375	30 KW	9375 ±30	17
6510	Mag.	9375	65 KW	9375 ±30	17
4J52A	Mag.	9375	70 KW	9375 ±30	17
4J50A	Mag.	9375	225 KW	9375 ±30	17
L-3039P	Mag.	9375	225 KW	9375 ±30	17
L-3613	Mag.	9375	225 KW	9375 ±30	17
L-3030	Mag.	9375	300 KW	9375 ±30	17
L-3039N	Mag.	9400	225 KW	9400 ±20	17
L-3036A	Mag.	9410	65 KW	9410 ±5	17
L-3509	Mag.	9625	110 W	8775—10475	19
L-3463	Mag.	9625	250 W	8775—10475	19
L-3728	MBWO	9750	150 W	8500—11000	19
L-3434	Mag.	9950	0.10 KW	9950 ±30	15
L-3759	Mag.	15550	60 KW	15550 ±100	17
L-3645•	Mag.	16200	4.0 KW	16200 ±100	15
L-3452	Mag.	16200	2.2 KW	16200 ±75	15
L-3358	Mag.	16250	1.0 KW	16000—16500	15
L-3496	Mag.	16250	1.0 KW	16000—16500	15
L-3359	Mag.	16250	2.0 KW	16000—16500	15
L-3383	Mag.	16275	1.0 KW	16250—16300	15
L-3498	Mag.	16300	2.0 KW	16280—16320	15
L-3816•	Mag.	16500	25 KW	16500 ±150	17
L-3738•	Mag.	16500	40 KW	16500 ±150	17
L-3326	Mag.	16500	60 KW	16500 ±150	17
L-3083A	Mag.	16500	60 KW	16000—17000	17
L-3083B	Mag.	16500	60 KW	16000—17000	17
L-3083C	Mag.	16500	60 KW	16000—17000	17
L-3101A	Mag.	16500	60 KW	16000—17000	17
L-3101B	Mag.	16500	60 KW	16000—17000	17
L-3101C	Mag.	16500	60 KW	16000—17000	17
L-3692	R Kly.	21000	0.35 W	18000—24000	25
L-3642	R Kly.	23000	0.1 W	21000—25000	25
L-3631	F Kly.	23000	8.0 W	21000—25000	25
L-3630	F Kly.	23000	10 W	21000—25000	25
L-3751•	Mag.	34900	5.0 KW	34900 ±500	17
L-3752•	Mag.	34900	40 KW	34900 ±500	17
L-3856•	Mag.	34900	40 KW	34900 ±500	17
L-3753•	Mag.	34900	100 KW	34900 ±500	17
L-3632	R Kly.	35000	0.03 W	33000—37000	25
L-3710	R Kly.	35000	0.03 W	33000—37000	25
L-3633	R Kly.	35000	0.2 W	33000—37000	25
L-3659	F Kly.	35000	5.0 W	33000—37000	25
L-3628	F Kly.	35000	10 W	33000—37000	25
L-3629	F Kly.	35000	15 W	33000—37000	25
L-3713	F Kly.	35000	30 W	34000—36000	25
L-3736	F Kly.	35000	50 W	34000—36000	25
L-2062	M.D.	35250	12 KW	34500—36000	25
L-3693	F Kly.	50000	1.0 W	48000—52000	25
L-3640	F Kly.	50000	1.0 W	48000—52000	25
L-3691	F Kly.	74000	0.1 W	68000—80000	25
L-3690	F Kly.	74000	0.1 W	68000—80000	25
L-3638	F Kly.	74000	0.1 W	68000—80000	25
L-3639	F Kly.	74000	0.5 W	68000—80000	25
L-3689	F Kly.	74000	0.5 W	68000—80000	25

•Indicates new since 1962 condensed catalog.

TUBE & EQUIPMENT LISTING BY TYPE NUMBER

Tube No.	Type	Page No.
4J50A	Mag.	17
4J52A	Mag.	17
L-2060	M.D.	25
L-2061	M.D.	25
L-2062	M.D.	25
L-3023	Mag.	15
L-3028D	Mag.	15
L-3029A	Mag.	15
L-3029B	Mag.	15
L-3029C	Mag.	15
L-3029D	Mag.	15
L-3030	Mag.	17
L-3030B	Mag.	17
L-3030C	Mag.	17
L-3035	Kly.	21
L-3036A	Mag.	17
L-3036B	Mag.	17
L-3036F	Mag.	17
L-3039D	Mag.	17
L-3039E	Mag.	17
L-3039F	Mag.	17
L-3039G	Mag.	17
L-3039H	Mag.	17
L-3039I	Mag.	17
L-3039J	Mag.	17
L-3039K	Mag.	17
L-3039L	Mag.	17
L-3039M	Mag.	17
L-3039N	Mag.	17
L-3039P	Mag.	17
L-3039R	Mag.	17
L-3058	Mag.	15
L-3083A	Mag.	17
L-3038B	Mag.	17
L-3038C	Mag.	17
L-3087A	Mag.	15
L-3089	Mag.	15
L-3101A	Mag.	17
L-3101B	Mag.	17
L-3101C	Mag.	17
L-3103	Mag.	17
L-3105	Mag.	15
L-3168	Mag.	17
L-3180	Mag.	15
L-3181	Mag.	15
L-3187	Mag.	15
L-3212	Mag.	15
L-3213	Mag.	15
L-3214	Mag.	15
L-3218	Mag.	15
L-3225	Mag.	15
L-3226	Mag.	15
L-3227	Kly.	21
L-3238	Mag.	15
L-3239	Mag.	15
L-3250	Kly.	21
L-3257	Kly.	21
L-3268	Mag.	15
L-3270	Kly.	21
L-3303	Kly.	21
L-3323	Kly.	21
L-3326	Mag.	17
L-3327	Mag.	15
L-3355	Kly.	21
L-3358	Mag.	15
L-3359	Mag.	15
L-3379	Mag.	15
L-3380	Mag.	15
L-3381	Mag.	15
L-3382	Mag.	15
L-3383	Mag.	15
L-3384	Mag.	15
L-3387	Kly.	21
L-3401	Kly.	21
L-3403	Kly.	21
L-3408	Switch	23
L-3429	Mag.	15
L-3431	Mag.	15
L-3434	Mag.	15
L-3452	Mag.	15
L-3455	Mag.	17
L-3456•	CW Mag.	19
L-3459•	CW Mag.	19
L-3460	CW Mag.	19
L-3461	CW Mag.	19
L-3462	CW Mag.	19
L-3463	CW Mag.	19
L-3464	CW Mag.	19
L-3465	CW Mag.	19
L-3467	CW Mag.	19
L-3468	CW Mag.	19
L-3469	Mag.	15
L-3470	TWT	23
L-3471	TWT	23
L-3472	TWT	23
L-3486	Kly.	21
L-3496	Mag.	15
L-3498	Mag.	15
L-3499	TWT	23
L-3502	CW Mag.	19
L-3503	CW Mag.	19
L-3504	CW Mag.	19
L-3505	CW Mag.	19
L-3506	CW Mag.	19
L-3507	CW Mag.	19
L-3508	CW Mag.	19
L-3509	CW Mag.	19
L-3510	CW Mag.	19
L-3530	Kly.	21
L-3531	Kly.	21
L-3601	Mag.	15
L-3602	Mag.	15
L-3603	Mag.	15
L-3604	Mag.	15
L-3605	Mag.	15
L-3611	TWT	23
L-3612	TWT	23
L-3613	Mag.	17
L-3618	Kly.	21
L-3620	Switch	23
L-3628	F Kly.	25
L-3629	F Kly.	25
L-3630	F Kly.	25
L-3631	F Kly.	25
L-3632	R Kly.	25
L-3633	R Kly.	25
L-3634	TWT	25
L-3635	Mag.	15
L-3638	F Kly.	25
L-3639	F Kly.	25
L-3640	F Kly.	25
L-3642	R Kly.	25
L-3645•	Mag.	15
L-3647	Kly.	21
L-3652	CFA	19
L-3654	Mag.	15
L-3657	TWT	23
L-3659	F Kly.	25
L-3660	Kly.	21
L-3661	Kly.	21
L-3663	TWT	23
L-3674	TWT	23
L-3689	F Kly.	25
L-3690	F Kly.	25
L-3691	F Kly.	25
L-3692	R Kly.	25
L-3693	F Kly.	25
L-3694	Kly.	21
L-3702	Kly.	21
L-3707•	Kly.	21
L-3710	R Kly.	25
L-3711	TWT	23
L-3713	F Kly.	25
L-3714	CW Mag.	19
L-3721	MBWO	19
L-3724	MBWO	19
L-3725•	MBWO	19
L-3726	MBWO	19
L-3727•	MBWO	19
L-3728	MBWO	19
L-3734	Switch	23
L-3735•	Kly.	21
L-3736	F Kly.	25
L-3738•	Mag.	17
L-3739•	Kly.	21
L-3742•	Kly.	21
L-3751•	Mag.	17
L-3752•	Mag.	17
L-3753•	Mag.	17
L-3759•	Mag.	17
L-3763•	TWT	23
L-3768•	Kly.	21
L-3769•	TWT	23
L-3775•	Kly.	21
L-3812•	Mag.	15
L-3813•	Mag.	15
L-3815•	TWT	23
L-3816•	Mag.	17
L-3820•	Mag.	15
L-3822•	Switch	23
L-3823•	Kly.	21
L-3824•	TWT	23
L-3843•	Kly.	21
L-3847•	Kly.	21
L-3856•	Mag.	17
6344A	Mag.	17
6510	Mag.	17
6543	Mag.	17
6543A	Mag.	17
7156	Mag.	17
A3A1•	CRT	27
A9A2•	CRT	27
B3C2	CRT	27
C1E11•	CRT	27
C2A11A•	CRT	27
C3A1•	CRT	27
C5A11	CRT	27
C5A16•	CRT	27
C5C16•	CRT	27
C5S11•	CRT	27
C7A11•	CRT	27

Equip. No.	Type	Page No.
C10T7	CRT	27
C14A4•	CRT	27
C21A4•	CRT	27
E1E11	CRT	27
E2A16	CRT	27
G5A11	CRT	27
K1E32•	CRT	27
PX 275•	CRT	27
A100	Amp.	27
A106	Amp.	27
A107	Amp.	27
A108•	Amp.	27
A111	Amp.	27
A112•	Amp.	27
A113•	Amp.	27
A114•	Amp.	27
PM101•	Pow. S	27
PS101	Pow. S	27
PS102	Pow. S	27
PS103	Pow. S	27
PS105	Pow. S	27
PS107	Pow. S	27
PS110	Pow. S	27
RG100	Gen.	27
S103	Mount	27
SY101	Gen.	27
5RG	Mount	27
WL-54	Load	29
WL-82	Load	29
WL-88	Load	29
WL-209	Load	29
WL-210	Load	29
WL-246	Load	29
46	Coil	21
56	Coil	21
120	Coil	21
156	Coil	21
166	Coil	21
187	Coil	21
190	Coil	21
200	Coil	21
201	Coil	21
203	Coil	21
204	Coil	21
208A	Coil	21
211	Amp.	29
215•	Coil	21
216•	Coil	29
217•	Pow. S	29
218•	Pow. S	29
219•	Pow. S	29
221•	Pow. S	29
222•	Pow. S	29
231•	Pow. S	29
242•	Pow. S	29
242A•	Pow. S	29
258•	Pow. S	29
261•	Pow. S	29
267•	Coil	21
269•	Pow. S	29
270•	Pow. S	29
271•	Coil	21
272•	Coil	21
276•	Pow. S	29
288•	Coil	21
3653	Pow. S	29
201377	Coil	21

•Indicates new since 1962 condensed catalog.

TYPE DESIGNATIONS

AMP—Amplifier
CFA—Crossed-Field Amplifier
CRT—Cathode Ray Tube
Coil—Focus Coil
CW Mag.—Continuous Wave Magnetron
F Kly.—Floating Drift Tube Klystron
Fil. C.—Filament Controller
Gen.—Generator
Kly.—Klystron
Load—Water Load
Mag.—Magnetron
MBWO—M-type Backward Wave Oscillator
M.D.—Monitor Diode
Pow. S—Power Source
R. Kly.—Reflex Klystron
Switch—Switch Tube
TWT—Traveling Wave Tube

MARKETING

APPLICATION ENGINEERING SERVICES & REGIONAL OFFICES—

Main Marketing offices are located in San Carlos, California, where application engineering specialists are available for consultation. Please telephone LYtell 1-8411. Locations of our regional offices are listed below:

1. NORTHEAST
   221 Crescent Street
   Waltham, Massachusetts
   TWinbrook 9-2238

2. EAST
   P. O. Box 548
   Manasquan, New Jersey
   CAstle 3-4160

3. DISTRICT OF COLUMBIA
   1625 "I" Street N.W.
   Washington 6, D. C.

4. SOUTH
   307 Clairmont Drive
   Warner-Robins, Georgia
   923-3397, Area Code 912

5. MID-WEST
   333 West First Street
   Dayton, Ohio
   BAldwin 3-3285

6. WEST
   341 North Foothill Road
   Beverly Hills, California
   TRemont 8-1570

Foreign sales are handled through:

1. Elliott-Litton, Ltd.
   Manor Way
   Borehamwood, Hertfordshire
   London, England
   (serving British Commonwealth, excluding Canada)

2. Lake Engineering Co., Limited
   123 Manville Road
   Scarborough, Ontario, Canada
   (serving Canada)

3. Litton World Trade Corporation
   P. O. Box 110
   Zurich 50, Switzerland
   (serving Free Europe, Africa and Middle East)

4. Kobe Kogyo Corporation
   No. 5, Wadayama Dori 1-Chome
   Hyogo-Ku, Kobe, Japan
   (serving Free Asia)

Affiliated Companies:

1. Elliott-Litton, Ltd.
   Manor Way
   Borehamwood, Hertfordshire
   London, England

2. Kobe Kogyo Corporation
   No. 5, Wadayama Dori 1-Chome
   Hyogo-Ku, Kobe, Japan

LITHO IN U.S.A.