SYLVANIA ELECTRONIC TUBES 1961 IRE MARCH 20-23
BOOTHS NOS. 2322-32 8415-85



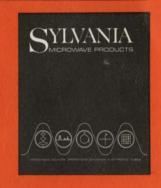
COMPLETE TECHNICAL INFORMATION— A Service to Engineers from Sylvania

The material below is only a partial listing of technical data and brochures available from the Sylvania Electronic Tubes Division. Additional information may be procured from your Sylvania Sales Engineer—Request that he put you on his mailing list. His address is on the back page.

SYLVANIA ENGINEERING DATA SERVICE—The most complete and comprehensive engineering data service available with full information on nearly 2.000 types of receiving tubes, cathode ray tubes, microwave devices, counter tubes, and electroluminescent display devices. Initial subscription price \$28 including 5 binders. Subsequent yearly maintenance fee \$5 (approximately 7 supplemental inserts per year).



SYLVANIA MICROWAVE BIND-ER — Available upon request from your Sylvania Sales Engineer. A convenient reference for Sylvania microwave products including klystrons, magnetrons, ferrite devices, traveling wave tubes, and backward wave oscillators.



TECHNICAL MANUAL — Abbreviated engineering data on over 1,800 types of receiving tubes, cathode ray tubes. A handy desk reference for Design Engineers. Price \$3.00 including supplemental mailings.



COUNTER TUBE HANDBOOK— Complete technical data on Sylvania counter tubes and application information including typical circuits.



RECEIVING TUBE APPLICA-TION NOTES—A 56 page brochure detailing the important parameters and considerations for Design Engineers utilizing electronic receiving tubes. This is the most comprehensive text on the subject available.



26.5 VOLT SUBMINIATURE TUBES—Design Engineers utilizing subminiature tubes will find valuable data and specifications in this booklet.



ELECTROLUMINESCENT DIS- PLAY DEVICES—Ten pages of descriptive material explaining the principles on applications of electroluminescent display devices.



GUIDED MISSILE TUBES—Engineering and application data, and descriptive material covering testing procedures, ratings, etc., on Sylvania subminiature tubes designed for guided missile applications.



Sylvania receiving tube developments

THE SYLVANIA STRAP FRAME GRID-

A rigid, self-supporting frame obtained by welding straps across the siderods, permitting an increased number of lateral wires of much smaller diameter. Its greater strength allows closer and more uniformed grid cathode spacing for narrow characteristics dispersion — much higher Gm and Gm/Ib ratio—greater control of cutoff characteristics—high stability and resistance to shock and vibration.

SYLVANIA TUBES PRESENTLY USING STRAP FRAME GRIDS INCLUDE:

6ER5—semi-remote cutoff triode for RF amplifier TV tuner application.

6DJ8—sharp cutoff double triode for RF cascode amplifier TV tuner test equipment application.

6FQ5A—semi-remote cutoff triode for RF amplifier VHF application.

6FQ5—semi-remote cutoff triode for RF amplifier VHF TV application.

6GK5—semi-remote cutoff triode for RF amplifier VHF TV application.

7803—medium-mu double triode for special frequency multiplier and power output application.

6ES8—semi-remote cutoff double triode for cascode amplifier TV tuner application.

6EH7—semi-remote cutoff pentode for IF amplifiers TV application.

6EJ7—sharp cutoff pentode for IF amplifiers TV application.

SYLVANIA-DEVELOPED SARONG CATH-

ODE — A major tube refinement that stabilizes cathode performance — adds life to tube service.

A thin film of cathode material precisely controlled for uniform density and surface smoothness wrapped on an ultrasonically cleaned cathode sleeve. The Sarong Cathode electrical characteristics from tube to tube are extremely uniform, as is the spacing between cathode

and plate. Minimizes plate-to-cathode arching—eliminates hot spots—density control assures uniform emissions over the entire surface—reduces heater-to-cathode arching.

SYLVANIA TYPES WITH SARONG CATH-ODE INCLUDE:

5V4GA—cathode type high vacuum rectifier.

6AL5—miniature high perveance double diode.

6AU4—indirectly heated half-wave rectifier.

6AU6-miniature sharp cutoff pentode.

6AX4—indirectly heated half-wave rectifier.

6BA6—miniature semi-remote cutoff pentode.

6BC8—miniature, medium-mu, semiremote cutoff twin triode.

6BQ7/A – miniature, medium-mu, twin triode.

6BY5GA—indirectly heated half-wave rectifier.

6BZ7—miniature medium-mu twin triode.

6CY5 - miniature sharp cutoff tetrode.

6DA4—indirectly heated half-wave rectifier.

6DE4—indirectly heated half-wave rectifier.

6FQ5A-semi-remote cutoff triode.

6K6GT—high efficiency pentode power amplifier.

6U8—medium-mu triode and sharp cutoff pentode.

6V6GT-beam power pentode.

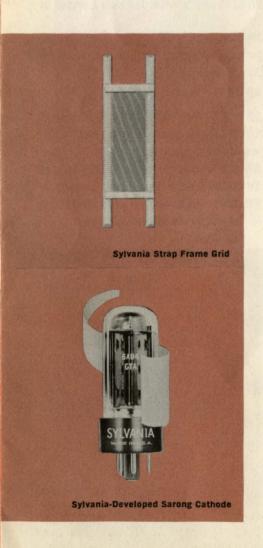
6W4GT—indirectly heated half-wave rectifier.

7F7-high-mu double triode.

12AU7/A—non-microphonic double triede

12AX7/A—miniature high-mu twin triode.

3525-half-way rectifier.



NOW GOLD BRAND SUBMINIATURE TUBES WITH BIKINI CATHODE, AND STRAP FRAME GRIDS.

Gold Brand Subminiature tube reliability and proven performance is now further enhanced with Bikini Cathode and Strap Frame Grids — Gold Brand Subminiature tubes that undergo the most rigorous and extensive testing procedures for insured performance.

Bikini Cathode using the same manufacturing techniques as the Sarong Cathode, attaches the emissive coating only to those surfaces where emission is desired, the sleeve edges are not coated. This increased control of the emission area means—increased gain—decreased noise factor—higher Gm/lb ration—elimination of spurious emission.

With rugged strap frame grids—a near ideal combination for high db gain, unusually low noise, and an exceptional ratio of Gm per uA of plate current.

STRAP FRAME, BIKINI CATHODE, SUBMINIATURE TYPES:

SR-2662B — medium-mu double triode with heater power of 0.7W per section and low Eb of 30V per section. Gm per mA of Ib for a single section is 1120... used for cascode RF amplifier-mixer, high-speed multivibrator service.

SR-2662C—medium-mu double triode, a high performance version of the general purpose 6021 with a Gm of 13,000 umhos. Ratio of Gm/lb is 1730 per section... used for cascode RF amplifier-mixer, high-speed multivibrator service, SR-2941A—high-mu triode with Gm of 12,000 umhos, draws but 125 mA @ 6.3V heater power. Gm per mA lb is 1300. Provides 2.5 db better gain than usually found in present high-performance types.

SR-2942B – high-mu triode, with low heater power of 125 mA @ 6.3 V and high Gm of 13,500 umhos. Has 2.5 to 7

db gain improvement, 1.5 to 4dh noise improvement at 48 OMC...used for grounded grid RF amplifier applications.

SYLVANIA 9T-9 DEVELOPED BY SYLVANIA — A 9 pin tube without the T9 octal base — larger tube assemblies where higher power dissipation capabilities are a design requirement. Has the straight sided bantam envelope and a miniature 9-pin circle.

NEW 9T-9 TYPES:

6EW7 — double triode designed for use as a television vertical deflection oscillator and amplifier.

10EW7 — identical to 6EW7 except for heater characteristics.

6HC8 – triode pentode designed as a vertical deflection oscillator and amplifier in 110° deflection circuits of television receivers.

17HC8 — identical to 6HC8 except for heater characteristics.

7695 – beam power pentode with unusually high power sensitivity as an AF amplifier. In class A1 operation, self-biased, it delivers 4.5W power output with a B+ voltage of only 140 volts.

7754 - 6-volt version of 7695.

6GM5 — beam pentode with improved sensitivity and output characteristics for AF power amplifier with 43 watt output.

6GC5 — beam power pentode with high power sensitivity as an audio power amplifier with 2.0 watt output.

SYLVANIA 10-PIN TUBES — Expanded capacity with a minimum of chassis redesign with the addition of a 10th pin to the center of the 9-pin miniature circle—improved performance—greater multiunit combinations — savings in circuitry—reduced space requirements. With the addition of the 10th pin, heat dissipation capabilities are increased, cathodes have separate connections,

shielding is introduced reducing undesirable oscillator signal radiation.

19E9 - triple triode.

6C9/17C9 — sharp cutoff double tetrodes, two high-performance units in compact T-6½ envelopes. Designed for VHF service as RF amplifiers and autodyne mixers.

Sylvania 10-pin double tetrode tubes are presently used by Sarkes Tarzian in their new FM tuner.

NEW 12-PIN TUBES—SYLVANIA 12-T9, 12-T12 TYPES—Presently under development at Sylvania are new 12-pin tube types for TV receiver applications. A natural advance in small, multi-function tubes, Sylvania 12-pin tubes utilize dome-shaped bulbs evacuated from the bottom for reduced seated height. 12-pin tube prototypes are:

12-T9 TYPES USING THE T-9 BULB SR3202 — diode for use as a damper in TV.

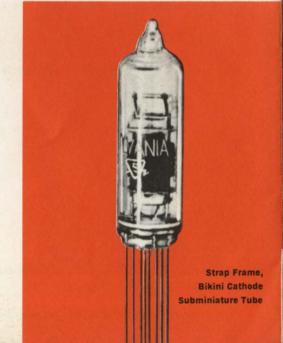
SR-3203 – double diode, double triode for use as TV horizontal phase comparator and oscillator.

SR-3210 - double pentode.

12-T12 TYPES WITH THE T-12 BULB SR-3201 — double diode for use as TV low voltage, full wave rectifier.

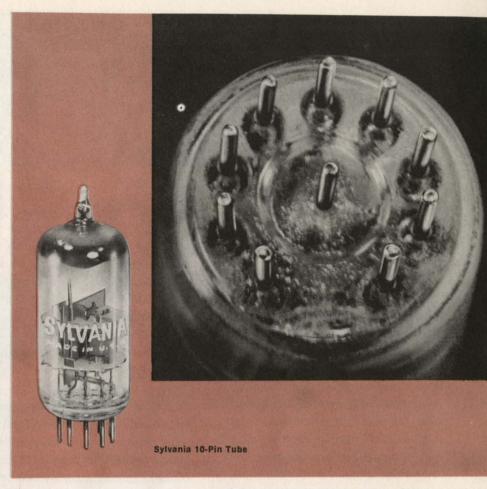
SR-3204 – double pentode for use as TV sound discriminator and output.

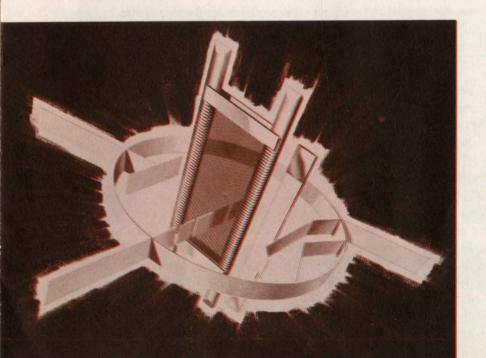
SR-3205 – beam power pentode for use in TV horizontal deflection circuit.



receiving tube developments

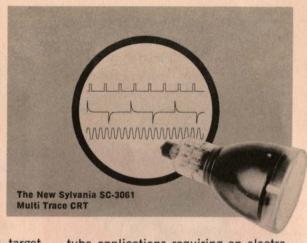








Sylvania industrial cathode ray tubes



THE NEW SYLVANIA SC-3061 MULTI-TRACE CRT - Features three highly reliable, independently controlled electron guns capable of tracing three displays simultaneously on its 10" diameter face. The guns focus undeflected spots 13/8" apart on a common vertical line. The useful horizontal scan of each gun is approximately 81/2". SC-3061 is electrostatically focused and deflected and features an astigmatism control electrode. Deflection factors, at 5KV anode voltage, are approximately 130V/ in. horizontal and 70V/in. vertical. It is available in a variety of phosphors. Engineering samples of the SC-3061 are available for customer evaluation.

THE NEW SYLVANIA SC-3093 – 3"
MONOSCOPE CRT FOR HIGH-SPEED
PRINTING – The custom built SC-3093
provides signal generation of characters
to associated high-speed printing equipment. It features electrostatic deflec-

tion and focus and gives a 2 sq. target plate with a capability of 64 alphanumeric characters. Similar monoscope CRT's can be supplied to individual customer specifications, or samples of the SC-3093 can be supplied with the art work for the target area supplied by the customer.

SYLVANIA SC-3075 HIGH RESOLU-TION, ELECTROSTATIC PRINTING TUBE

-The Sylvania high resolution, electrostatic printing tube, type SC-3075 prints 20,000 characters per second or more than 10,000 lines of non-repetitive computer output information per minute. Representative of Sylvania's capabilities in cathode ray tube technology, the SC-3075 was developed for the A. B. Dick Company Videograph Electrostatic Printing Process and is proprietary. However, Sylvania welcomes inquiries and specifications for specialized cathode ray

tube applications requiring an electrostatic printing tube.

SYLVANIA "BONDED SHIELD" CATH-ODE RAY TUBES FOR INDUSTRIAL DESIGNS - Now, Sylvania adds the advantages of "Bonded Shield" to industrial cathode ray tubes. For industrial applications, "Bonded Shield" elimininates safety plates and front assemblies and cuts reflecting surfaces 50% for improved image readability. Image display is out front for wide angle viewing, mounting, styling, maintenance and replacement are all simplified. The tube face is strengthened against breakage and easily cleaned, an important factor in "sealed" equipment. "Bonded Shield" is a usable writing surface, and may be permanently etched with a calibrated reference scale to reduce parallax errors. Virtually all popular cathode ray tubes, from 3" to 27' can be supplied with Sylvania "Bonded Shield."

Sylvania picture tubes

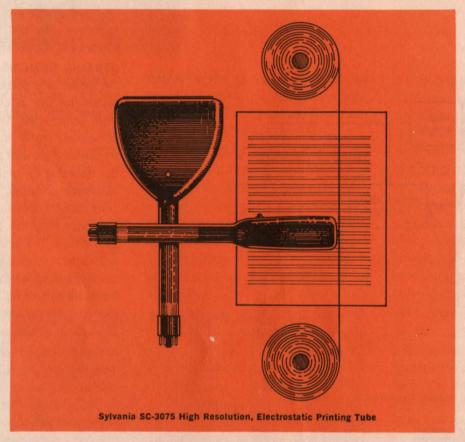
SYLVANIA "BONDED SHIELD" PICTURE TUBES WITH THE NEW "HIGHLIGHT" ANTI-REFLECTION COATING — A scratch-resistant, annealed-glass safety cap, Sylvania "Bonded Shield" reduces the danger of implosion . . . minimizes production-line rejects . . . simplifies mounting . . . has squared corner screen . . . offers new cabinet design . . . and reduces reflection with HighLight, a startling, new anti-reflection coating that prevents glare and reflection without

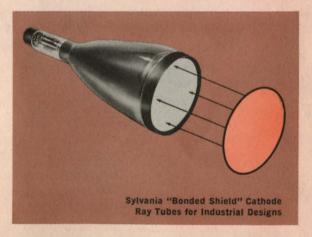
compromising picture quality. Engineering samples of 19" and 23" "Bonded Shield" picture tubes with "HighLight" anti-reflection are available.

SYLVANIA NEW "BALANCED OPTICS" ELECTRON GUN—At Sylvania, parallel refinement and improvement of all elements of the electron gun has culminated in the "balanced optics" gun, that gives full picture power — pin point focus—improved drive characteristics—

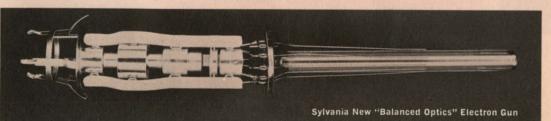
brilliant high-resolution highlights. Sylvania "balanced optic" electron gun refinements include microsheen surface, hair splitting spacing and tolerance control, micrometer design techniques, new electrode contours, corona suppression, beam guard and halo control, optimized performance for each neck length and planar focus. Only Sylvania gives you "balanced optics" gun, another superior part of the industry's finest picture tube.



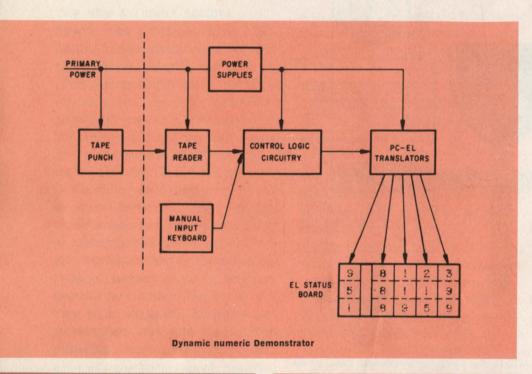








Sylvania electroluminescent display devices







The applications of Electroluminescent Devices are broad and varied. In order to stimulate use and demonstrate feasibility of EL components, Sylvania has designed and constructed several unique "models". In addition to providing a means of demonstration, these "models" are continually tested for performance, life and feasibility. Several of these "models" are described below.

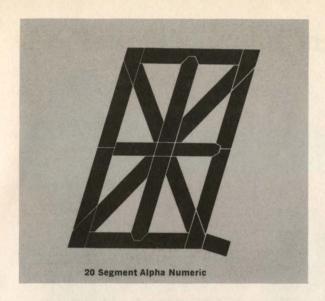
DYNAMIC NUMERIC DEMONSTRATOR

—A model of a portion of an announce system for use at civilian airports has been constructed. The demonstrator is completely solid state and employs transistor logic with provisions for manual updating of information as well as automatic updating. The display portion consists of three rows of flight information including the flight number and arrival time. The numeric EL characters are each 1" high and are formed on a single glass substrate. Code conversion from the binary logic is performed by Electroluminescent - Photoconductive binary to numeric converters.

ALPHA-NUMERIC DISPLAY BOARD -

This board features 253 alpha-numeric display devices of the Sylvania type AN150. The character height is 1½" and is composed of 14 segments plus a decimal point. All the letters in the alphabet plus the numbers and some symbols may be obtained with each device. The driving power is low (15 mw/character) and provides wide angle viewing without parallax.

EL LAMP COLORS — The lamp constructed demonstrates two basic EL phosphor colors, blue and green. Red light output is obtainable by the addition of a red fluorescent dye to the blue lamp. Display devices are generally made with the blue phosphor and the completed device is furnished with a blue filter to improve contrast and reduce reflections.



NUMERIC WITH ELECTROLUMINES-CENT-PHOTOCONDUCTIVE (EL-PC) TRANSLATOR (SYLVANIA TYPE SM100)

— The numeric is the Sylvania type NU150 which consist of 9 segments plus a decimal point in a 1½" size. The switching matrix is an EL-PC translator capable of accepting a 10 line decimal input and converting to the necessary combination of segments to form the individual numbers.

NUMERIC WITH NEON-PHOTOCON-DUCTIVE TRANSLATOR—This display is similar to the EL-PC except that the photoconductors are driven by neon lamps rather than EL lamps. This translator is the Sylvania type SM106.

LARGE ALPHA-NUMERIC—This display features an 8" character composed of 20 segments. Alpha-numerics are available in various sizes from %" to 20".

ALPHA-NUMERIC WITH NEON-PHOTO-CONDUCTIVE HOLD CIRCUIT. (SM150)

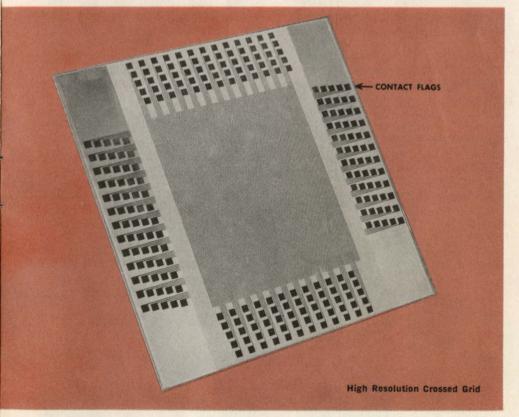
 For computer driven status boards where the input information is fed sequentially, these devices will supply the necessary "memory" to hold the displayed character on after the driving signal has been removed. The character is erased simply by removing the power supply momentarily.

crossed grids – Large displays may be fabricated by placing individual crossed grids side by side. It is possible to produce a blue phosphor with a cross effect contrast ratio of 4:1 and a green phosphor with a contrast ratio of 15:1. Maximum resolution with individual crossed grids is 50 lines/in.

PHOTOGRAPHIC APPLICATIONS — EL devices are finding increasing usage in applications where permanent photographic records are required. This information can be alpha-numeric, special symbol or binary coded decimal. The blue light output of the EL devices is well suited to the film so that contact exposures can be made. This eliminates complex optical projection systems and their associated costs. By using dot matrixes or crossed grids, large quantities of information may be recorded in small space.

A digital voltmeter can be converted to in-line display to improve the readability. The numeric are driven by ELPC translators and utilizes transistor gating to keep the whole system solid state.

Most Electroluminescent Devices Described Are Available In Production Quantities. All Are Available For Engineering Evaluation.



Sylvania microwave devices

LOW-PRICED PPM-FOCUSED TWT'S FOR TEST EQUIPMENT APPLICATIONS 50% SMALLER! 80% LIGHTER!

Sylvania introduces important advantages to microwave amplifier applications where economy, compact size, light weight are vital design considerations. Less than 4 lbs. in weight and 21/4" in maximum diameter, Sylvania TWT's for test equipment present unusual opportunities for design of compact equipment when compared with bulky 15-35 lb. package of the solenoid types. However, electrical performance advantages over solenoid types are still maintained. Investigate the wide range of TWT's by Sylvania.

Types	Frequency Range (kMc)	Power Output	Gain-db (Min.)	
TW-4267	1-2	10 mW	35**	
TW-4268	1-2	1W	30*	
TW-4261	2-4	10 mW	35**	
TW-4260	2-4	1W	30*	
TW-4281	4-8	10 mW	35**	
TW-4278	4-8	1W	30*	
TW-4282	8-12	5 mW	35**	
TW-4273	8-12	1W	30*	

**Small signal gain *At saturation Sample quantities of L- and S-band TWT's immediately available.

BROADBAND FERRITE ISOLATORS -

Available in both coaxial and waveguide configuration. Many are of octave frequency bandwidth. Total frequency coverage is 1.0 to 26.0 GC with isolation as high as 30 DB and peak power capabilities up to 2 kilowatts.

TYPICAL RATING: 30 DB isolation, 1 DB isolation loss, VSWR-415.

FD-1537:	1-2 KMC
FD-151P:	2-4 KMC
FD-492:	4-8 KMC
FD-1519:	3.95-5.85 KMC
FD-502:	5.8-8.2 KMC
FD-512:	7.05-10.0 KMC
FD-522:	8.2-12.4 KMC
FD-7530:	10.0-15.0 KMC
FD-7515:	12.2-12.7 KMC
FD-7516:	12.2-12.7 KMC
FD-911:	12.4-18.0 KMC
531A.	18 0-26 0 KMC

THE FD-7511 WAVEGUIDE FERRITE ISOLATOR is representative of Sylvania's line of X-band isolators fitted



PPM-Focused TWT

with WR-75 waveguide flanges. This series of isolators provides isolation of 20, 40, and 60 db from 10.7 to 11.7 Gc, and 25, 40, and 60 db from 12.2 to 12.7 Gc. The devices employ integral temperature compensation to assure uniform performance from -30 to +60°C. They are engineered for use in common carrier and commercial communication systems. Weight: 13, 15, or 17 ounces. Size: 11/2, 2, or 21/2 inches.

THE SYLVANIA FD-151P COAXIAL FER-RITE ISOLATOR provides minimum 15 db isolation from 2 to 4 Gc with 1 db maximum insertion loss. It is a highperformance isolator particularly useful for test-bench applications. Weight: 31/4 pounds. Length: 834 inches.

20KW TO 120KW PEAK POWER OUT-PUT WITH SYLVANIA KA BAND MAG-NETRONS - Sylvania Ka Band Magnetrons fill virtually all your Ka band requirements. They include extremely compact types with exceptional powerto-weight ratios. All are fixed-frequency types for pulsed operation, utilize stabilized magnets, and exhibit outstanding reliability and longevity.

SYLVANIA-5789, first commercially available U.S. type for Ka band, uses 22-vane "rising sun" anode, and improved dispenser-pressurized output, it is highly adaptable to high altitude operation.

SYLVANIA-6799 features 120KW peak power output and is a proven high-power millimeter wave source. It is available for use with longer pulses and higher duty cycles at slightly reduced power. SYLVANIA M-4155A, ruggedized version of the 5789, features compact size and weight of only 9 lbs., improved heat dis-

sipation and excellent stability. It utilizes a special cone-shaped cathode support and "building block" mounting arrangement for added mechanical strength. M-4155A possesses both long and short pulse capabilities.

SYLVANIA XM-4064, ruggedized magnetron, offers exceptional stability under severe environmental conditions. Only 9 lbs. in weight, it provides peak power output of 70KW for a remarkably good power-to-weight ratio.

SYLVANIA XM-4158, ruggedized magnetron, provides 120KW peak power output. It uses E type magnets for a uniform, flat surface configuration that can be used as a structural part of the chassis. XM-4158 is compatible with either long or short pulse operation.

SYLVANIA XM-4218, ruggedized tube, provides a power-to-weight ratio of 8:1 making it especially suited for portable, fieldtype radar. It uses metal-to-ceramic seals, ceramic cathode capsule, cantilever cathode support. The tube withstands 50g shock, 10g vibration tests. XM-4218 provides a lower pushing factor than tubes of comparable perform-

SYLVANIA M-4206 is a ruggedized, compact tube with encapsulated cathode. Only 10.5 lbs., it provides 40KW peak power output.

SYLVANIA'S SB-100 D-C BLOCK offers 2 kilovolts d-c voltage isolation at any frequency from 2.5 megacycles to 10,000 megacycles. It presents a VSWR of less than 1.3 to 1, insertion loss of 0.2 db, and peak power rating of 2 kilowatts (CW rating: 100 watts). Can be obtained with Type N (illustrated), BNC, or TNC connectors. Weight: under 4 ounces.



The Sylvania FD-7511 **Waveguide Ferrite Isolator**





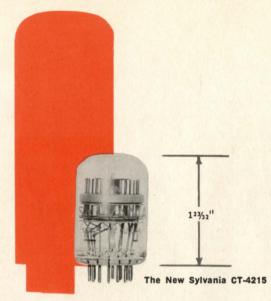


Sylvania Ka Band Magnetron

Sylvania decade counter tubes







A device so versatile it can count . . . measure ... monitor ... program ... sample . . . sort . . . index . . . scale . . . tabulate. Sylvania Decade Counter Tubes combine actuating and direct visual readout functions - readout from a sharply defined ion glow moving on a peripheral ring of 10 output cathodes around a common anode. Sylvania Counter Tubes have "add-subtract" capabilities, low power requirements, reliable long life, improved performance, and low cost. Its use significantly reduces circuitry and component requirements, enabling compact designs and reduced equipment costs.

THE NEW SYLVANIA CT-4215—The First Decade Counter Tube in the Dome Shaped T-9 Bulb with 10 Output Cathodes.

With a new dome-shaped T-9 bulb evacu-

ated from the base, Sylvania CT-4215 gives significant reductions in seated height with all the advantages and versatility of tube types available previously only in the T-11 bulb. It has 10 output cathodes, and the diameter of the ring of cathodes is identical to that of types in the T-11 outline, providing the same excellent readout visibility. The Sylvania CT-4215 is extremely economical and allows the design of very compact, low cost counting equipment in the 0-100KC frequency range. Also, sockets for its 13-pin circle are far less expensive. And, the Sylvania CT-4215 can be designed into equipment using printed circuit techniques.

INCLUDED AMONG COUNTER TUBE APPLICATIONS ARE:

SWITCHING: As many as ten sources of information can be coupled to each out-

put cathode. By transferring the glow from cathode to cathode, each of these sources is made available from the anode.

COMPUTING: The counter tube can simply convert from digital to analog functions. The step function is achieved from the glow current across values of increasing resistance in each of the output cathodes as the glow is transferred.

SCALING: A typical application. Input could come from Geiger tubes, photoelectric cells or any other electronic

FREQUENCY DIVIDING: The reset capability of the counter tube allows a given time base by a selectable factor from two to ten.

CODE GENERATION: By selectively wiring the cathodes, various code patterns can be generated.

Sylvania Types	Total Anode Current (mA) Min. Max.		Min. Anode Supply Voltage (Vdc)	Min. Double Pulse Amplitude (V)	Min. Double Pulse Width (μsec)
0-4KC 6476 (T-11) 6802 (T-9) 6879 (T-5½)	0.3	0.6	350	—75	60
0-100KC 6909 (T-9) 6910 (T-11) 7155 (T-5½)	0.6	0.8	400	—85	4
CT-4251	0.65	0.8	400	—70	4

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