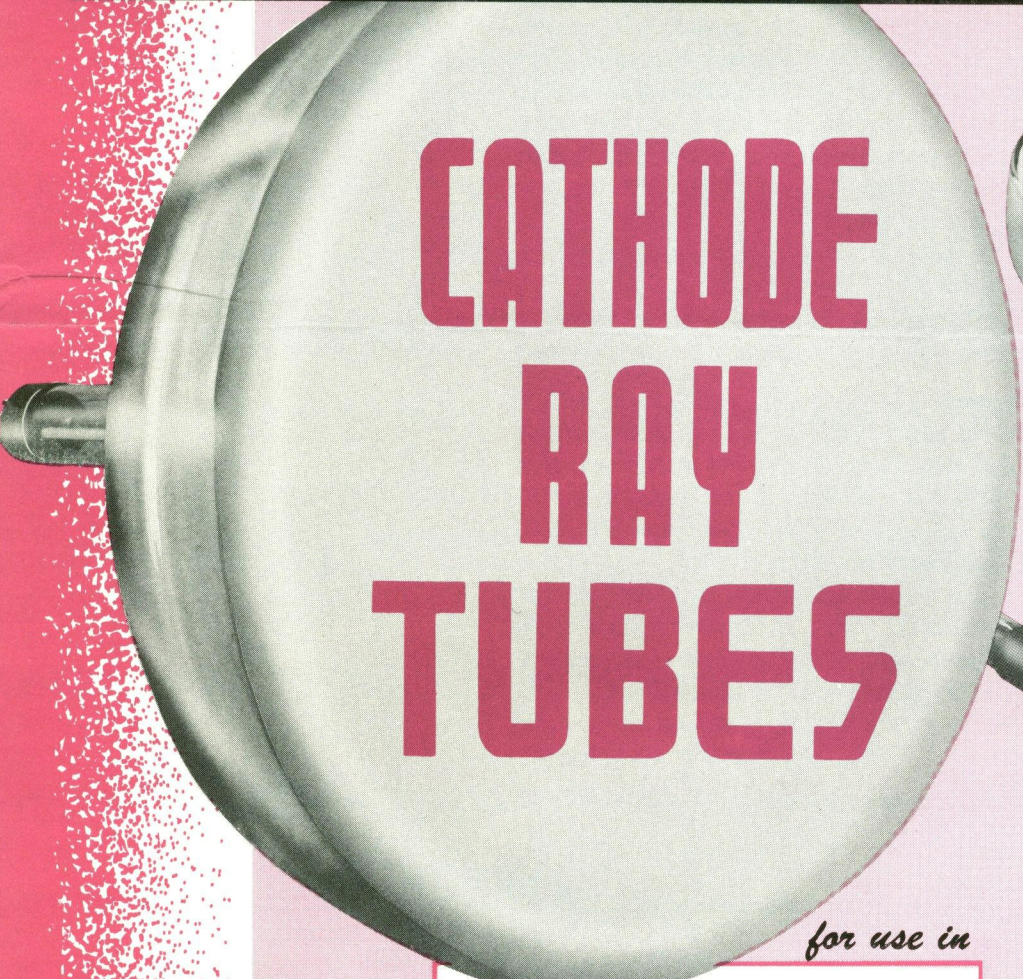


Industrial and Military



CATHODE RAY TUBES

for use in

OSCILLOSCOPES
RADAR DISPLAYS
FLYING SPOT SCANNERS
VIDEO RECORDERS
INDUSTRIAL MONITORS
TV CHECK TUBES
SPECTRUM ANALYZERS
OSCILLOSCOPE PHOTOGRAPHY
and other applications



Thomas

ELECTRONICS Inc.

118 NINTH ST.
PASSAIC, N. J.

CHART OF INDUSTRIAL-MILITARY CATHODE-RAY TUBE CHARACTERISTICS

MAGNETIC DEFLECTION TYPES

JEDEC TYPE NO.	OVERALL LENGTH (Inches)	FACEPLATE AND SCREEN (See * below)	DEFLECTION ANGLE (Degrees)	OUTSIDE CAPACITANCE (mmf)	FOCUSING METHOD	ION TRAP	JEDEC BASING	JEDEC BASE NO.	TYPICAL OPERATING CONDITIONS			
									ANODE VOLTAGE (KV DC)	ACCELERATOR GRID VOLTAGE (V DC)	NEGATIVE CUT- OFF VOLTAGE (V DC)	FOCUSING VOLTAGE (V DC) or CUR- RENT (MA DC)
3AKP	6-3/8	CA	36° Offset	None	ES	No	Spec. Coded	Molded	7	300	45-95	-50 to 350 V
3HP	9-13/16	C	55	None	M	No	5AN	B8-65	5	150	15-45	—
4BP	13-1/8	C	50	100-500	M	No	8ET	B8-65	25	No Grid	75-175	—
4CP	11-1/4	C	50	100-500	M	No	12G	B5-57	20	—	70-140	—
5ACP	11-1/8	CA Rd	53	None	ES	No	8EQ	B8-65	12	250	27-63	-50 to 350 V
5AEP	11-1/8	C Rd	53	None	ES	No	8EQ	B8-65	7	250	25-70	-50 to 350 V
5AHP	11-1/8	C Rd	53	None	ES	No	8EF	B8-65	7	300	28-72	-50 to 350 V
5AHP_A	11-1/8	CA Rd	53	None	ES	No	8EF	B8-65	7	300	28-72	-50 to 350 V
5AKP	12-9/16	A Rd	50	100-500	M	No	12G	B5-57	30	No Grid	80 to 140	250 MA
5ALP	7-1/4	C Rd	53	None	M	No	9DF	—	8	200	50	—
5AUP	12-1/2	CA Rd	40	100-500	ES	No	12C	B6-63	25	40-100	40-100	5200 V
5AUP	10-5/8	C Rd	53	None	ES	No	12S	B5-57	14	300	28-72	AUTO
5BCP	7	C Rd	70	None	M	No	9DF	E3-37	8	—	25-75	56-84 MA
5BNP	10-5/8	CA Rd	53	None	ES	No	12M	B6-63	14	300	28-72	-50 to 350 V
5CKP	16-5/8	C Rd	42	None	M	No	12AM	B7-51	20	1000	35 to 110	135 MA
5FP_A	11-1/8	C Rd	53	None	M	No	5AN	B8-65	6	250	25-70	75-102 MA
5QP_A	11-1/8	CA Rd	53	None	M	No	5AN	B8-65	10	300	28 to 72	137 MA
5TP	11-3/4	CA Rd	50	100-500	ES	No	12C	B7-51	27	200	40-100	—
5WP	11-7/16	CA Rd	50	100-500	ES	No	12C	B7-51	27	200	42-98	6600 V MAX.
5ZP	14-3/8	CA Rd	40	100-500	ES	No	12C	B7-51	20	200	42-98	4700 V
7ABP	13-1/4	C Rd	50	None	ES	No	12M	B6-63	7	300	33-77	-50 to 350 V
7ABP_A	13-1/4	CA Rd	50	None	ES	No	12M	B6-63	7	300	28-72	0 to 250 V
7AJP	19	CA	40	None	M	No	12D	B6-63	14	550	75-150	77 MA
7BP	13-1/4	C Rd	53	None	M	No	5AN	B8-65	7	250	50	99-135 MA
7BP_B	13-1/4	C Rd	53	None	M	No	5AN	B8-65	7	250	25-70	99-135 MA
7CP	13-1/16	C Rd	55	400-1500	ES	No	8BQ	B8-65	6	250	25-68	1200 V
7DP	14-1/16	C Rd	50	500 Max.	ES	Double	12C	B7-51	6	250	25-65	—
7HP	13	C Rd	50	500 Max.	M	No	12N	B5-57	6	250	28-72	—
7LP	13-1/4	CA Rd	53	None	ES	No	8EQ	B8-65	12	250	27-63	0 to 250 V
7MP	12-3/4	C Rd	50	None	M	No	12D	B5-57	7	250	27-63	105-140 MA
7OP	12-7/8	C Rd	52	None	M	Single	12D	B5-57	8	300	28-72	80 MA
7RP	14-1/16	CA Rd	50	None	M	No	12D	B5-57	9	250	27-63	80 MA
7SP	14-1/16	C Rd	50	100-500	M	No	12G	B5-57	20	—	63-147	195 MA
7TP	13-1/8	CA Rd	50	None	ES	No	12Q	B6-63	10	200	23-53	2200 V MAX.
8DP	10-7/16	G Re	90	250-350	ES	Single	12AB	B6-158	8	200	22-51	-50 to 350 V
8FP	11-7/16	GA Re	90	500-1500	M	Single	12D	B5-57	16	300	35 to 72	125 MA
9LP	14-31/32	C Rd	55	None	M	No	5AN	B8-65	7	250	60-100	—
9MP	17-1/2	C Rd	55	None	M	No	5AN	B8-65	6	250	25-75	—
10KP_A	17-5/8	G Rd	50	None	M	No	12D	B7-51•B5-57	9	250	27-63	105 MA (Approx.)
10NP_A	17-5/8	GA Rd	52	500-1500	M	No	12G	B5-57	18	No Grid	62-125	110 MA (Approx.)
10QP	17-9/16	C Rd	50	100-500	M	No	12G	B5-57	20	—	63-147	190 MA
10SP	16-5/8	CA Rd	50	None	ES	No	12Q	B6-63	14	200	18-48	1900 V
10UP	17-5/8	C Rd	50	None	ES	No	12M	B6-63	10	300	38-72	0 to 350 V
10UP_A	17-5/8	CA Rd	50	None	ES	No	12M	B6-63	10	300	28-72	0 to 350 V
10VP	17-5/8	CA Rd	50	500-2500	M	No	12N	B5-57	11	250	28-72	110 MA (Approx.)
10WP	16-15/16	G Rd	50	None	ES	No	12M	B6-63	10	300	28-72	0 to 350 V
10WP_A	16-15/16	GA Rd	50	None	ES	No	12M	B6-63	10	300	28-72	0 to 350 V
12ABP	18	G Rd	55	None	ES	No	12M	B6-63	10	300	28-72	0 to 350 V

JEDEC TYPE NO.	OVERALL LENGTH (Inches)	FACEPLATE AND SCREEN (See * below)	JEDEC BASING	JEDEC BASE NO.	NO. OF GUNS	DEFLECTION FACTOR	POST ACCEL- ERATOR VOLTI- AGE (KV DC)	ACCELERATOR GRID VOLTAGE (V DC)	FOCUSING VOLTAGE (V DC)	NEGATIVE CUT-OFF (V DC)
12BP_A 12AP_A 12AGP_A 12DP_	18 18-5/16 18-5/16 20-3/4	GA Rd G Rd GA Rd C Rd	55 54 54 55	None None None None	ES M ES M	No No No 5AN	10 12 12 7	300 500 500 250	28-72 28-72 28-72 22-66	0 to 350 V 110 MA (Approx.) 0 to 350 V 75-102 MA
12DP_A 12DP_C 12DP_G 12KP_A 12SP_	19-5/8 19-5/8 17-5/8 18-3/4	G Rd GA Rd GA Rd C Rd	50 50 54 55	None 500-2500 None	M M M M	No No No 12N	7 7 11 9	250 250 250 250	22-66 22-66 27-63 27-63	99-135 MA 75-102 MA 110 MA (Approx.) 105 MA (Approx.)
12SP_B 12SP_D 14WP_	18-3/4 18-3/4 13-3/16	GA Rd GA Rd GA Re	55 55 90	None None 80-1200 None	M M ES ES	No No No 12L	9 9 12 9	250 300 300 250	27-63 27-63 28-72 27-63	105 MA (Approx.) 105 MA (Approx.) 0 to 350 V 0 to 350 V
16AP_	22-1/16	GA Rd	53	None	ES	No	12	300	32 to 70	100 to 200 V
16LP_	22-1/4	C Rd	52	750-2000	M	Double	12	300	38-72	95 MA
16WP_	17-3/4	G Rd	70	None	M	Double	12	250	27-63	95 MA
16WP_A	17-3/4	G Rd	70	750-1500	M	Double	12	250	27-63	92 MA
17ADP_	19-3/16	GA Re	70	None	M	No	12	300	27-63	0 to 350 V
17BCP_	19-1/4	GA Re	70	None	ES	No	12	250	27-63	0 to 350 V
17LP_	19-3/16	G Cy Re	70	750-1500	ES	Single	14	300	33-77	0 to 350 V
17QP_	19-3/16	G Cy Re	70	750-1500	M	Single	14	300	28-72	95 MA (Approx.)
21AMP_A	20	GA Re	90	2000-2500	M	Single	16	300	28-72	105 MA (Approx.)
21EP_	23	G Cy Re	70	None	M	Single	16	300	28-72	95 MA (Approx.)
21FP_	23	G Cy Re	70	None	ES	Single	16	300	28-72	95 MA (Approx.)
22CP_	22-1/16	C Rd M	70	None	M	Single	12	300	33-77	105 MA (Approx.)
22DP_	22-1/16	C Rd M	70	None	ES	No	12	300	33-77	105 MA (Approx.)
22EP_	23-1/16	GA Re	90	None	M	Single	16	300	38-72	-50 to 350 V 105 MA

ELECTROSTATIC DEFLECTION TYPES

JEDEC TYPE NO.	OVERALL LENGTH (Inches)	FACEPLATE AND SCREEN (See * below)	JEDEC BASING	JEDEC BASE NO.	NO. OF GUNS	DEFLECTION FACTOR				TYPICAL OPERATING CONDITIONS		
						D1 (V DC/Inch)	D2 (V DC/Inch)	D3 (V DC/Inch)	D4 (V DC/Inch)	POST ACCEL- ERATOR VOLT- AGE (KV DC)	ACCELERATOR GRID VOLTAGE (V DC)	FOCUSING VOLTAGE (V DC)
1DP 1EP 2AP 2AP_A	3 4-1/16 7-7/16 7-7/16	C FL C FL C8 C8	9CU 11V 11B 11L	Min. 9 Pin E11-22 Magnal 11 Pin Sm. Shell Mag.	1 1 1 1	350 210-310 115 230	300 240-350 98 196	None None None None	600 1000 500 1000	150 100-300 125 250	100 Max. 14-42 15-45 30-90	
2BP 3AP 3AP_A 3AP_P	7-5/8 11-1/2 11-1/2 10-3/4	C8 C8 C8 C FL	12E 7AN 7CE 14T	B12-43 Med. 7 Pin Med. 7 Pin B14-38	1 1 1 2	230-310 47 114 164-198	148-200 45 109 148-181	None None None 4	2000 600 1500 2000	300-560 170 430 480	135 Max. 14-40 25-75 45-75	
3ACP 3ADP 3ANP 3AP_P	10 10 9-1/8 9-1/8	C FL C FL C15 Re C8	14J 12Z 12E 12E	B12-37 B12-43 B12-43 B12-43	1 1 1 1	180-220 140-160 146-198 146-198	133-163 61-70 52-70 52-70	4 4 None None	2000 2000 2000 2000	545 320-470 330-620 330-620	45-75 52-87 58-135 58-135	
3BP 3BP_A 3CP 3DP	10 10 10-3/8 10-7/16	C8 C8 C8 C8	14A 14G 11C 14C	B12-37 B12-37 Med. Mag. 11 Pin B12-37	1 1 1 1	168 200 124 166	123 148 165 123	None None None None	1500 2000 2000 1500	430 575 575 430	22.5-67.5 30-90 30-90 22.5-67.5	
3DP_A 3EP 3FP 3FP_A	10-7/16 9-15/16 10 10	C8 C8 C8 C8	14H 11N 14B 14J	B12-37 B12-37 Wafer Mag. 11 Pin B12-37	1 1 1 1	220 221 221 250	148 165 164 180	None None 2 4	2000 2000 2000 2000	575 575 575 575	30-90 30-90 30-90 30-90	
3GP 3JP 3JP_A 3KP	11-1/2 10 10 11-1/2	C8 C8 C8 C8	11N 14J 14J 11M	B11-66 B12-37 B12-37 B11-66	1 1 1 1	64-96 170-230 180-220 50-68	56-84 125-270 133-163 38-52	None 4 4 None	1000 2000 2000 1000	163-291 400-690 400-690 160-300	16.5-49.5 30-90 45-75 45 Max.	
3MP 3QP 3RP 3RP_A 3SP	8 6-1/8 9-1/8 9-1/8	C8 C8 C15 Re	12F 9D 12E 12E	B12-43 European 9 Pin B12-43 B12-43	1 1 1 1	286-380 214-290 146-198 73-99	260-360 133-181 104-140 52-70	None None None None	2000 1200 2000 1000	400-700 240-480 330-620 165-310	126 Max. 31-74 45 to 135 28.5-67.5	
3UP 3WP 3XP 4DP	7-1/2 11-1/2 8-7/8 12-1/4	C FL Re C FL C15 Re C FL	12F 12T Spec. 14Y	B12-43 B12-43 D8-1 B12-37	1 1 1 2	246-310 83-101 68-92 115-140	232-296 57-70 25-38 90-115	None None None 4	2000 2000 2000 2000	330-620 330-620 370-650 335-615	126 Max. 60-100 28.5-67.5 52-87	
5AP 5BP 5ADP 5AP_P	13 16-3/4 16-3/4	C9 C FL C FL	11A 14J 14J	Large Magnal B12-37 B12-37	1 1 1	93 53-72 46-50	90 36-48 30.5-37.5	None 4 3	1500 2000 1500	430 400-690 300-515 400-690	21-57 52-87 34-56 45-75	



Thomas

ELECTRONICS Inc. 118 NINTH STREET
PASSAIC, N. J.



A=Aluminized, C=Clear, Cy=Cylindrical, G=Gray, M=Metal, Rd=Round, Re=Rectangular, FL=Flat, Sq=Square, Digit=Radius of curvature given in inches

Address inquiries to Manager of Sales, Industrial and Military Tube Division

5AP	18-1/4	C FL	Spec.	B12-37	2	54-66	49-60	4	2000	400-694	45-75
5AP	9-7/8	C7-1	Spec.	B12-37	1	230	230	6	750	400-900	30-60
5AP	17-5/8	C FL	14U	B12-37	1	40-50	20-25	None	2500	0-300	34-56
5AP	16-3/4	C FL	14G	B12-37	1	40-50	31.5-38.5	None	2500	0-300	34-56
5AP	16-3/4	C FL	14G	B12-37	1	40-50	31.5-38.5	None	2500	0-300	34-56
5ARP	18-1/2	C FL	Spec.	B12-37	2	45-55	31.5-38.5	None	2500	0-300	34-56
5ATP	17-5/8	C FL A	14V	B12-37	1	94-116	34-42	None	6000	0-700	34-56
5AP	16-3/4	C FL A	14P	B12-37	1	113-128	113-128	10.3	2300	500-730	33-55
5BP	16-3/4	C8	11A	Water Mag.	1	63	57	None	1500	310	20-60
5BP	16-3/4	C8	11N	Med. Mag. 11 Pin	1	84	76	None	2000	450	20-60
5BP	18-1/4	C FL A	14AB	B12-37	2	130-160	111-133	14	2000	400-630	45-75
5BP	18-5/16	C FL A	14G	B12-37	2	130-160	110-138	13.25	2750	600-900	35-65
5BP	17-1/2	C FL A	14AF	B12-37	1	70-86	28.4-34.8	10	1670	180-590	50-80
5BHP	18-1/4	C FL A	14AF	B12-37	1	70-86	15-18.3	10	1670	180-590	50-80
5CBP	18-1/4	C FL	14AG	B12-37	1	48.3-58.5	15-19	4	1900	190-555	62-85
5CP	16-3/4	C8	14B	B12-37	1	92	74	4	2000	575	30-90
5CP	16-3/4	C8	14J	B12-37	1	92	78	4	2000	575	30-90
5CP	16-3/4	C8	14J	B12-37	1	83-101	70-86	4	2000	400-690	45-75
5CAP	17-1/2	C FL	14AF	B12-37	1	48.3-61	22.6-28	6	1850	225-670	60-85
5BP	16-3/4	C8	11A	11 Pin Sleeve	1	36	72	None	2000	425	24-56
5BP	16-3/4	C8	11A	11 Pin Sleeve	1	63.5	57.8	None	1500	310	15-45
5HP	16-3/4	C8	11N	Med. Mag.	1	84	76	None	2000	450	20-60
5JP	16-3/4	C10	11E	11 Pin Mag.	1	96	96	2	1000	260	22.2-51.8
5JP	16-3/4	C10	11S	Med. Mag.	1	77-115	77-115	4	2000	333-630	45-105
5JP	16-3/4	C10	11F	Med. Mag.	1	103	90	4	2000	500	30-90
5LP	16-3/4	C10	11T	Med. Mag.	1	83-124	72-108	4	2000	376-633	30-90
5MP	15-7/8	C10	7AN	Large 7 Pin	1	66	60	None	1000	250	16.5-49.5
5NP	16-3/4	C FL	11A	11 Pin Sleeve	1	84	76	None	1500	337	15-45
5NP	16-3/4	C FL	14F	B12-37	1	140-210	131-197	20	2000	528	30-90
5RP	16-3/4	C FL	14F	B12-37	1	140-210	131-197	20	2000	363-695	30-90
5SP	18-1/2	C FL	14K	B12-37	2	74-110	62-94	4	2000	363-695	30-90
5SP	18-1/4	C FL	14K	B12-37	2	83-101	70-86	4	2000	363-695	45-75
5UP	14-3/4	C20	12E	B12-43	1	56-77	46-62	None	2000	340-640	90 Max.
5VP	16-3/4	C8	11N	Med. Mag.	1	70-98	63-89	None	2000	315-562	20-60
5XP	17-5/8	C FL	14P	B12-37	1	140-210	46-68	20	2000	362-695	30-90
5XP	17-5/8	C FL	14P	B12-37	1	130-159	42-52	12	2000	362-695	45-75
5XP	17-5/8	C FL A	14P	B12-37	1	130-159	42-52	12	2000	362-695	45-75
5YP	17-5/8	C8	14Q	B12-37	1	108-162	36-54	6	3000	541-1040	45-135
6DP	20-1/16	FL A	Spec.	B25-139	3	112-138	105-130	12	4000	950-1225	75-124
7AP	17-3/4	C30 A Re	Spec.	B25-139	3	86-130	84-126	9	3000	595-1020	87-112
7AP	15-1/2	C FL	14J	B12-37	1	81-101	67-83	4	2000	380-620	45-75
7AP	18-7/8	G30 A	Spec.	22 Pin Collar	1	175-195	170-186	None	8000	2000-2950	105-175
7AP	14-1/2	C	14G	B12-37	1	93-123	75-102	None	3000	810-1200	36-84
7AP	14-1/2	C20	14R	B12-37	1	186-246	150-204	None	6000	1620-2400	72-168
7VP	14-1/2	C20	14R	B12-37	1	93-123	75-102	None	3000	800-1200	84 Max.
7XP	18-5/8	C24	Spec.	22 Pin Collar	5	63-105	59-94	4	2000	440-750	22.5-67.5
7YP	18-1/2	C40 Sq	Spec.	B25-139	5	60-90	28-45	4	2000	50-90	50-90
8CP	16-1/2	C20	14A	B12-37	1	58-81	49-68	4	2000	540-800	24-56
10GP	18-1/2	C	14A	B12-37	1	125-165	100-135	None	5000	1250-1850	60-140
10HP	19-1/4	C	14G	B12-37	1	110-150	85-115	None	5000	1200-1800	60-140
12ACP	24-7/8	C40 A	14E	B12-37	2	140-190	130-180	None	7500	1750-2500	150-225
12FP	24	C	14E	B12-37	1	110	125	8	4000	1250	30-90
12GP	22	C	14S	B12-37	1	108	101	6	4000	1143	65-195
12HP	23-1/2	C	11J	11 Pin Sleeve	1	95	125	None	5000	1150	45-135
14AP	24-1/4	C	12A	12 Pin Per.	1	130	130	8	4000	1000	40-120
20AP	27-7/8	C	12A	12 Pin Per.	1	110	110	8	4000	1000	40-120

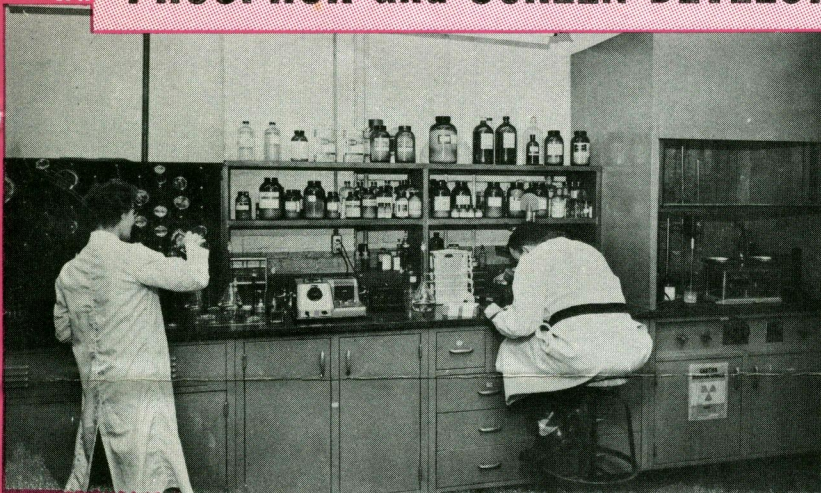
TESTING EQUIPMENT



Depicted at the left is a section of the Industrial-Military cathode-ray tube Test Department showing one of Thomas' test sets and a composite video signal generator. The test set was designed and built by Thomas Electronics for evaluating the electrical characteristics of electrostatic deflection cathode-ray tubes over a very wide range of operating conditions. Close-tolerance precision components, well-regulated power supplies and large-scale meters (accurate to within 0.5%) ensure precise measurements. The test set is capable of testing tubes according to MIL-E specifications. Similar test sets, employing advanced circuit design, are used by Thomas Electronics for testing magnetic deflection tubes. Test sets like the one shown on the left, and supplementary test equipment, are checked by Thomas' calibration laboratory in accordance with rigorous quality control schedules.

Cathode-Ray Tube Test Set

PHOSPHOR and SCREEN DEVELOPMENT



This is a section of Thomas' chemical laboratory showing a chemist and technician engaged in a phosphor screen development project. The lab is well equipped with up-to-date apparatus for complete analysis of tube and tube process materials, the formulation of materials and the preparation and evaluation of phosphors, phosphor screens and other tube coatings. While the main function of the laboratory is research as well as material and process development, it also works closely with production departments by chemically testing raw materials, issuing specifications for developmental tube type processes and troubleshooting shop problems.

Corner Section of One of Thomas' Laboratories

This brief summary of the THOMAS ELECTRONICS organization will acquaint you with our personnel, plant facilities and operation.

We welcome the opportunity to discuss your prototype and production requirements in greater detail.

Address all inquiries to: Jess E. Dines, Manager of Sales, Industrial and Military Tube Division of
THOMAS ELECTRONICS, Inc., 118 NINTH STREET, PASSAIC, N. J., U.S.A.

ABOUT THOMAS ELECTRONICS

Thomas Electronics, Inc., founded in 1949, was engaged initially in the design and manufacture of television picture tubes. In subsequent years, other product lines were added including cathode-ray tube component parts, industrial-military cathode-ray tubes and electronic equipment and cable assemblies. Advancements in automated production techniques (together with effective management, engineering, research and quality control facilities) have enabled Thomas Electronics to become one of the leading manufacturers of television cathode-ray tubes in the nation. Production capacity is presently in excess of 6,000 tubes a day. Headquarters in Passaic, New Jersey comprise a quarter-million-square-foot plant as well as manufacturing and warehouse facilities in St. Charles, Illinois; Cedartown, Georgia and Fort Worth, Texas. Overseas operations include manufacturing facilities in Australia and Italy.

In the laboratories, research and development groups are engaged in advanced product development and the study of new material and design concepts. A substantial portion of the laboratory and industrial-military area is air-conditioned and humidity-controlled for critical processing operations. The necessary facilities for fabrication and testing of experimental electron guns and tubes are available, as well as equipment for development work on metal and phosphor film evaporation techniques. Research groups are supplemented by efficient production engineers, equipment design specialists and industrial and application engineers to bring new developments into full scale production with minimum delays. At the present time, particular emphasis is being placed on the enhancement of light output of cathode-ray tubes when operating on low voltages and high precision, high resolution, tube and electron gun designs.

KEY PERSONNEL

KENNETH A. HOAGLAND *Director of Engineering*

Mr. Hoagland holds the degrees of B.S. and M.S. in electrical engineering from Newark College of Engineering and has done graduate work in physics and mathematics at the Polytechnic Institute of Brooklyn and Stevens Institute of Technology. He is a Senior Member of the I.R.E., a member of the American Physical Society, A.I.E.E. and Tau Beta Pi. From 1941 to 1959 Mr. Hoagland was associated with the Allen B. DuMont Laboratories in various engineering capacities including Chief Engineer, Cathode-Ray Tube Division; Director of Color Tube Research and Development; and Director of Engineering, Tube Operations. He is responsible for a number of innovations in cathode-ray tube design, such as high sensitivity tubes for wide-band oscillography, precision mono-accelerator instrument tubes and an electron beam focusing lens presently in general use for television picture tubes. Mr. Hoagland is a former Chairman of the JEDEC Committee on Cathode-Ray Tubes, Electronic Industries Association.

PETER SEATS *Manager, Research and Development*

Mr. Seats was educated in Europe and Australia, joining Thomas Electronics in 1954 after serving six years as Chief Chemist in the Cathode-Ray Tube Division of E.M.I. Ltd., England. In the past ten years, he has been responsible for a number of significant improvements in cathode-ray tube efficiencies, particularly in the areas of screen applications and aluminizing. Mr. Seats' experience and original approach to design and development problems concerning cathode-ray tubes are exemplified by a recently concluded project involving the use of radioactive tracers. He holds 18 patents in the cathode-ray tube field.

EDWARD LISOVICZ *Manager, Industrial and Military Tube Division*

Mr. Lisovicz has a B.S. degree in electrical engineering from the Newark College of Engineering and is a member of Tau Beta Pi. He has been associated with Thomas Electronics since its inception in 1949 and has made a number of significant contributions to the company's growth in the areas of production and processing engineering. His diversified experience includes plant production supervision, cathode-ray tube manufacturing processes; development of electron gun production techniques, gun design, and control of plant shrinkage, using statistical inspection and quality control procedures. He holds several electron gun design patents.

NICHOLAS E. BRODERICK *Director of Quality Control and Field Engineering*

Mr. Broderick holds a B.S. degree in physics from Fordham University. He has done graduate work at both Fordham and Syracuse Universities in the fields of electronics, mathematics and nuclear physics. He is a Senior Member of the I.R.E., a former chairman of the engineering section of the Cathode-Ray Tube Manufacturers' Association, a member of the Joint Electron Devices Engineering Council and the American Physical Society. Before joining Thomas Electronics, Mr. Broderick was connected with Sylvania Electronics Products where his duties included the design and development of optical systems and electron guns. He holds several cathode-ray tube patents.

