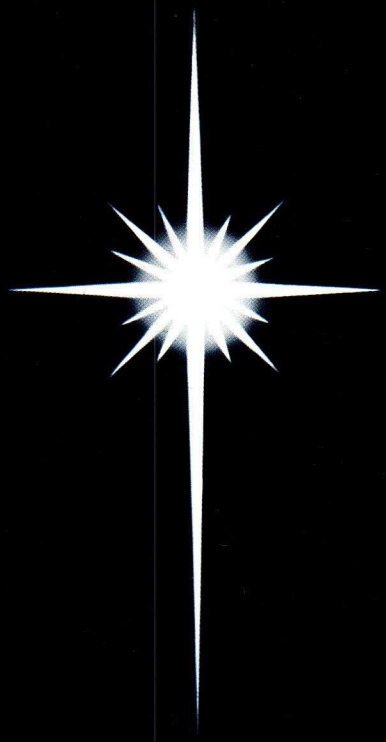
HAMAMATSU

PHOTOSENSITIVE DEVICES

'72

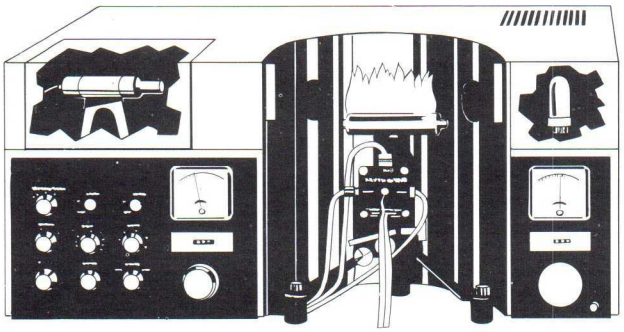


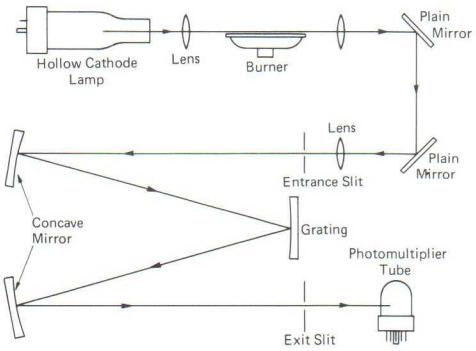
PHOTON
IS OUR
BUSINESS

Applications of Photomultiplier Tubes, Phototubes, Hollow

Photomultiplier tube	Absorptionmeter
	Atomic absorption spectrophotometer
	Atomic flourescence spectrophotometer
	Spectro florimeter
	Raman spectrophotometer
	Flame photometer
	UV–VIS–IR spectrophotometer
	Mercury vaper meter
	Ozone monitor
	Color meter
	Densitometer
	Scintillation counter
	Serveymeter
	Chelenkov counter
	Reflectometer
	Radio meter
Photo tube	Scatter photometer
	Dosimeter
	Colorimeter
	Optopyrometer
	Mass-spectrometer
	Vacuum UV spectrophotometer
	Electron spectroscope
	X-ray micro analyzer
	Combustion alarm
	Fire alarm
	Overflow detector
	Smoke detector
Hollow cathode lamp	Level indicator
	Automatic stopper for process control
	Flaws and cracks detector
	Pin hole detector
	Optical synchronizer
	Sorting machine for eggs, cereals, and fruit
	Lighting controller
	Fog indicator
	Limit switches for cranes and hot ingots
	Position indicator
	Safety devices for tools
	Thickness and size controller
Deuterium lamp	Automatic photograph enlarger
	Flying spot scanner
	EVR player
	Facsimile
	Curve reader
	Tape reader
	Wavelength reference standard
	Ultra violet light source

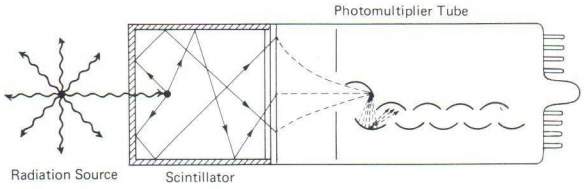
Cathode Lamps and Deuterium Lamps

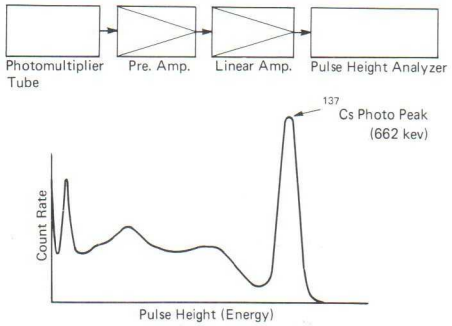




Atomic Absorption Spectrophotometer

Atomic Absorption Spectrophotometer is used for determining concentrations of solution or for plotting absorption spectra through the visible and near ultraviolet region of the spectrum by utilizing a photomultiplier tube as the detector and hollow cathode lamps as the light source.

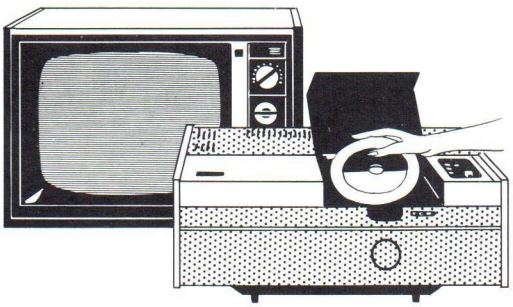


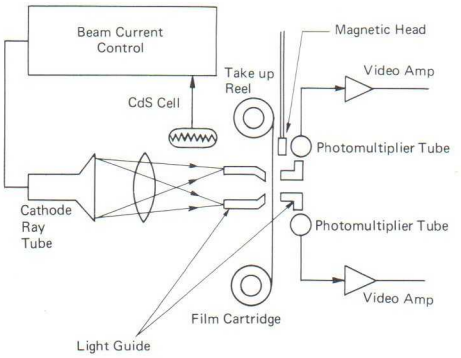


Scintillation Counter

Scintillation Counter uses the photomultiplier tube as the detector in order to see the energy spectrum. The pulse light is proportional to the incident radiation energy from the scintillator which has been exposed to the ionizing radiation.

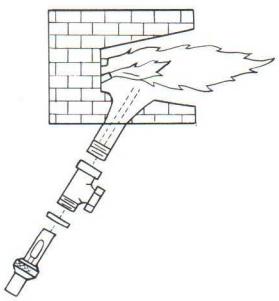
[source . . . . ^{137}Cs, scintillator . . . NaI (Tl)]

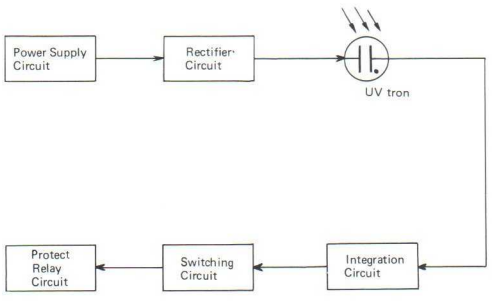




EVR Player

EVR stores pictures in EVR cartridges with sound for playback of consistently high resolution through a standard television set. Any motion picture, videotape or live television presentation can be recorded for the distribution on EVR. The circular EVR cartridge holds the film whose maximum capacity is equivalent to 50 minutes of programming.





UV tron

UV tron of HAMAMATSU TV CO.,LTD. can monitor the combustion of propane gas and heavy oil, and other fuels. It can detect the UV radiation from all flames even whose color is light purple or invisible. Also, UV tron can be used as the fire alarm or counting equipment, because it has little response to the incondescent light, fluorescent light or sunlight, by which very weak ultraviolet radiation emitted from a flame can be detected easily.

Applications of CdS Cells

Exposure Meter

Electronic Camera Shutter

Densitometer

Audio

TV Automatic Brightness Control

Smoke Dectector

Flame Monitoring

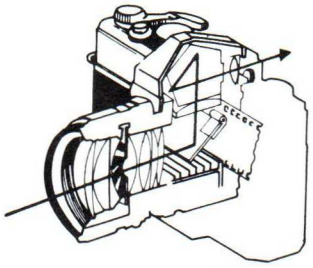
Digital Counting

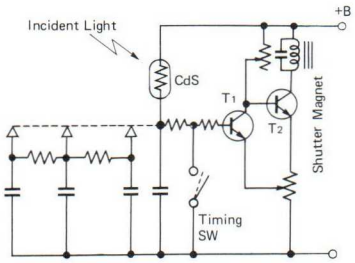
Photorelay

Street Light Control

Musical Instrument

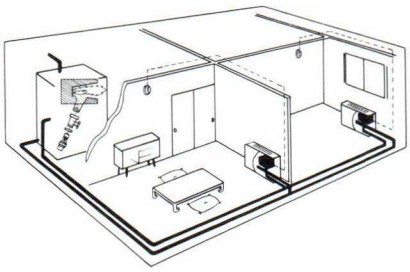
Photo Chopper

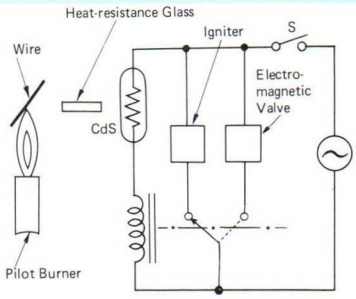




Electronic Camera Shutter

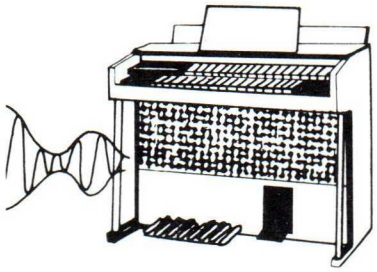
The shutter speed of a camera is controlled by the CR-Circuit. The diaphragm opening is set in advance and when the shutter is triggered a signal lamp is activated to indicate whether the diaphragm setting is suitable or not. When the shutter opens, the CR-Circuit begins to charge and when the pre-set voltage level is reached, the shutter closes.

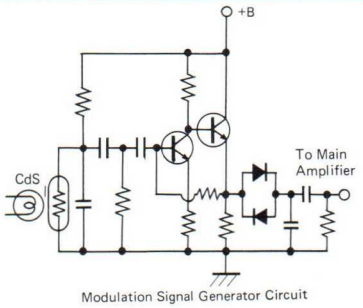




Flame Monitoring

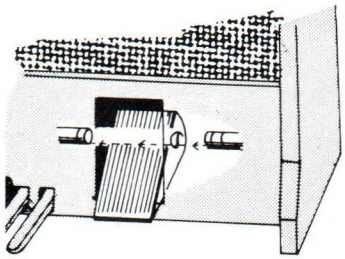
In this circuit a photoconductive cell detects the combustion of the pilot burner. The light from a red hot wire set in the pilot burner is conducted to the CdS cell through a piece of heat resistance glass. The resistance of the cell decreases so that the relay stops the operation of the igniter, the electro-magnetic burner valve opens, and the burner begins to operate normally. Should the flame accidentally die out, the light of the red hot wire diminishes and the cell resistance rises to again operate the igniter.

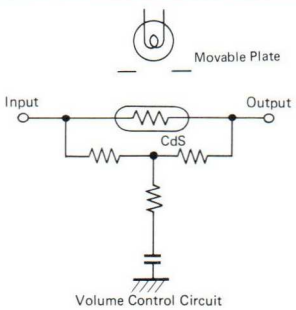




Musical Instrument

The touch-vibrate circuit is a system that transmits vibration effects to the sound signal through the keyboard. Slight motion of the shading plate is amplified so that the intensity of penetrating light can be detected or controlled. This circuit converts the change in cell resistance to a change in voltage, which is amplified. Essential ingredients are put through a band-pass filter whose center frequency is a few Hz, and they are then added to the sound siganl generator and used for frequency modulation.





Musical Instrument

This is a volume control circuit. Light from a lamp to the photocell passes through an aperture in a movable plate mounted on a hinged pedal. When the aperture moves, the amount of illumination falling on the photocell varies, and in turn regulates the volume. The resistors and a capacitor are added to maintain a minimum volume.

Applications of Video Equipments

Measuring for wobbling, bending, distortion and deviation in one dimension

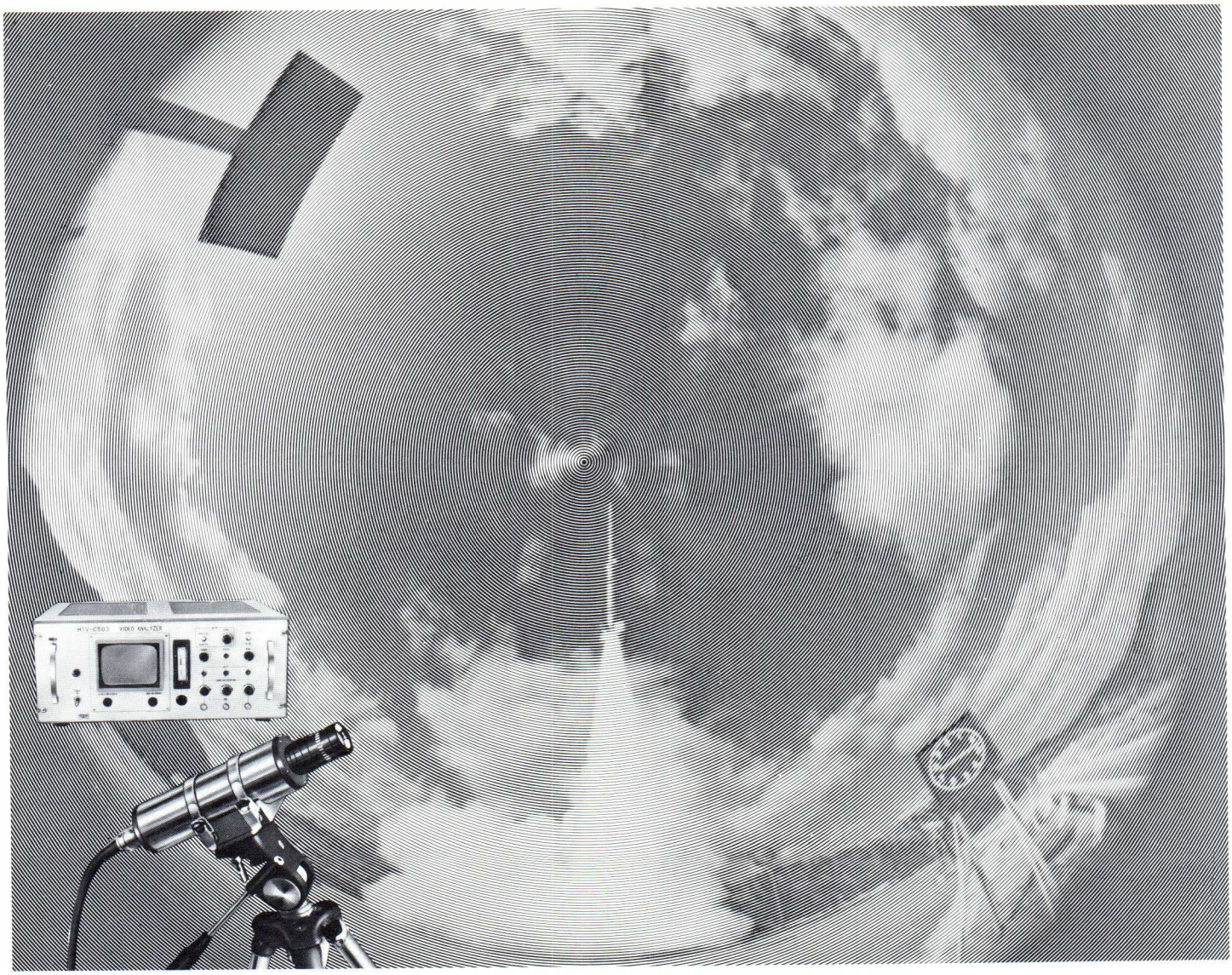
For robot eye, automatic–tracker of flying object in two dimensions

High-speed tracking

Area measuring

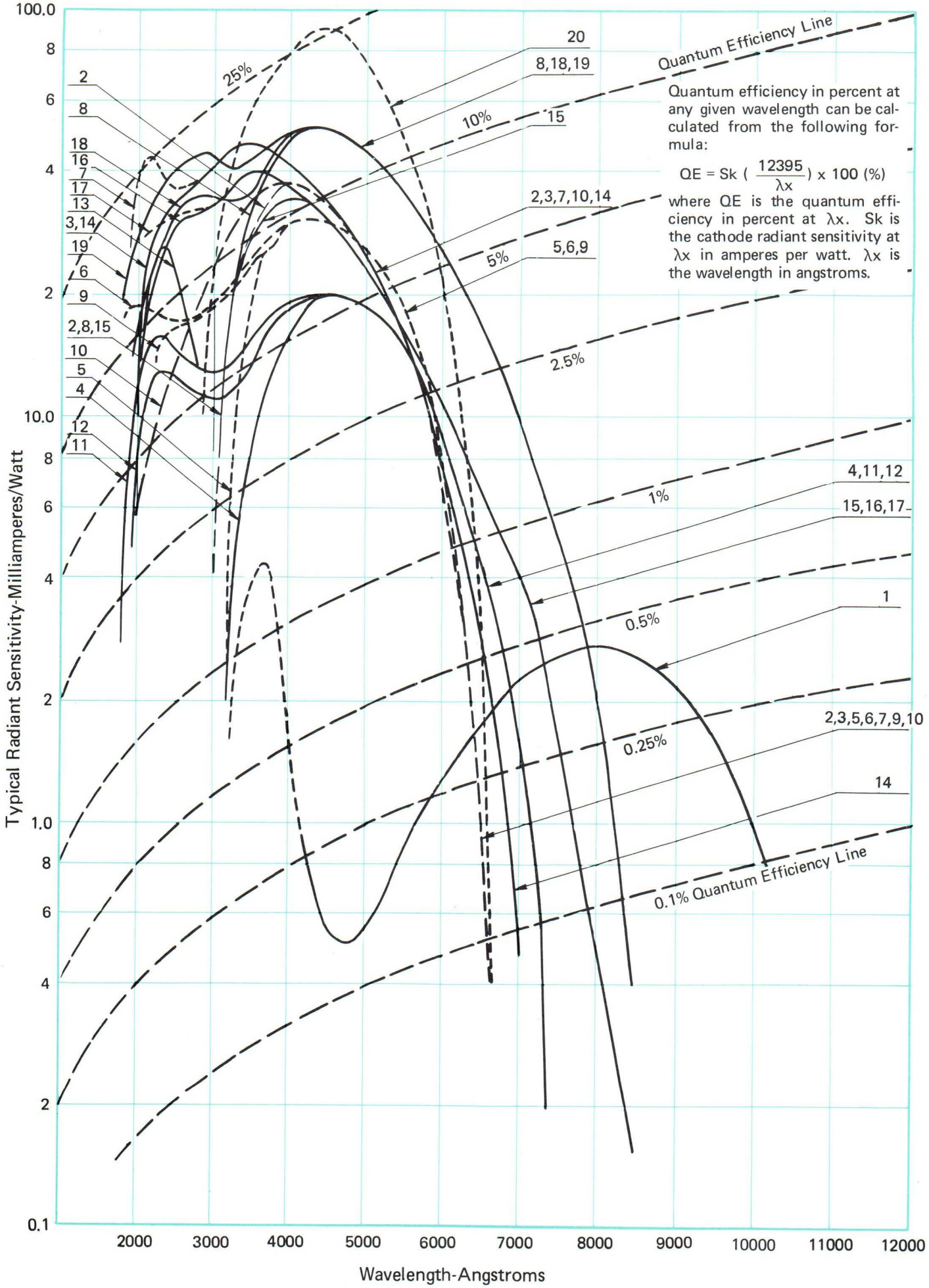
Observation in the infrared radiation

Analyzer for one shot of image



HTV-C583 is used for tracking a rocket automatically by utilizing an infrared vidicon which has excellent sensitivity to the infrared radiation from the flame at the rocket nozzle, so that the main tracking camera can be always controlled to pursue the rocket certainly.

Typical Photocathode Spectral Response Characteristics

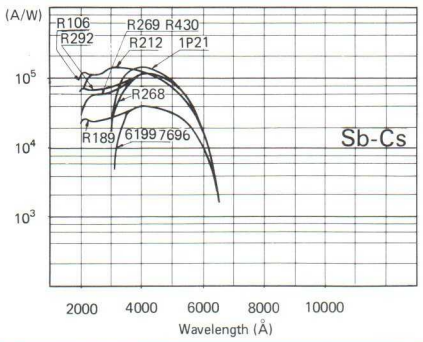
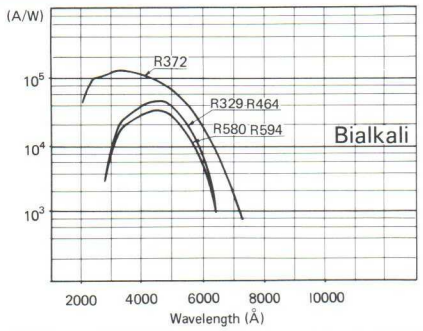
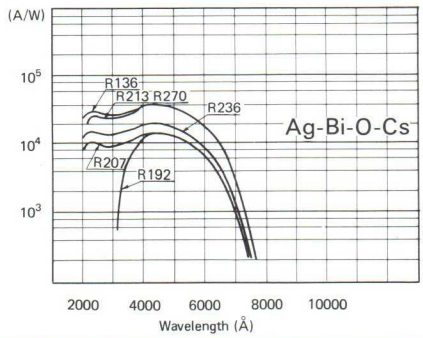
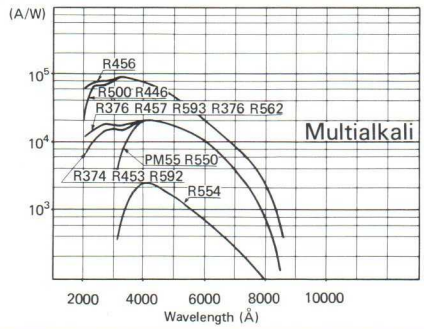
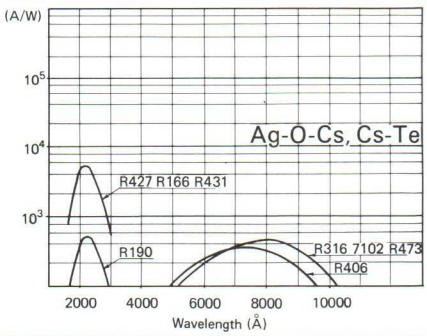


※ NO.	Photocathode Material	S-Number	Spectral Response Range of Photocathode (Å)	Window Material	Type
1	Ag-O-Cs	S-1	4000～12000	Borosilicate-glass	* R406 (Similar to S-1) R316 7102 R473 **PV11 PV29A PV45 R237 R317 PV22 PG12 PG25 PG27 6953
2	Sb-Cs	S-4	3000～6500	Borosilicate-glass	* PM57 R241 931A 1P21 R450 R105UH ** PV13 PV16 PV23 PV31A 90AV 1P39 R414 PG14A PG28 90AG 4409 R250
3	Sb-Cs	S-5	1850～6500	UV-glass	*R300 1P28 R212 R212UH **935
4	Ag-Bi-O-Cs	S-10	3000～8000	Borosilicate-glass	*R252 R192
5	Sb-Cs	S-11	3000～6500	Borosilicate-glass	*R268 R546 6199 7696 ***N333 N337
6	Sb-Cs	S-13	1600～6500	Fused-Quartz	*R292 R189
7	Sb-Cs	S-19	1600～6500	Fused-Quartz	*R306 R106 R106UH **R110
8	Na-K-Sb-Cs	S-20	3000～8500	Borosilicate-glass	**R424 *R550 PM55 ***R312 R571
9	Sb-Cs	S-21	1850～6500	UV-glass	*R269 R430
10	Sb-Cs		2000～6500	Special-glass	**R183
11	Ag-Bi-O-Cs		1600～8000	Fused-Quartz	*R136 R207 R236 **R310
12	Ag-Bi-O-Cs		1850～8000	UV-glass	*R213 R270 **R369
13	Cs-Te		1600～3200	Fused -Quartz	*R427 R166 R431 R190 **R404
14	Bialkali		1850～7300	UV-glass	*R372
15	Multialkali		3000～8500	Borosilicate-glass	*R554
16	Multialkali		1850～8500	UV-glass	*R500 R446 R446UR **R518
17	Multialkali		1600～8500	Fused-Quartz	*R456
18	Multialkali		1850～8500	UV-glass	*R374 R453 R567 R592 **R330 R314
19	Multialkali		1600～8500	Fused-Quartz	*R376 R457 R375 R593 R562
20	Bialkali		3000～6500	Borosilicate-glass	*R329 R464 R594 R580

* Photomultiplier Tubes ** Phototubes *** Image Pickup Tubes

※ Typical photocathode spectral response curve number.

Photomultiplier Tube Selection Guide

Typical Anode Radiant Sensitivity Curves	Window Material \ diameter (mm) (inch)		13 ($\frac{1}{2}$)	19 23 ($\frac{3}{4}$, $\frac{7}{8}$)	28 ($1\frac{1}{8}$)	38 ($1\frac{1}{2}$)	50 76 (2, 3)
	Borosilicate-glass	Side-On		PM57(¾") R241	931A 1P21 R105UH R450		
		Head-On			R268 R546	6199	7696
	UV-glass	Side-On	R300		1P28 R212 R212UH		
		Head-On			R269 R430		
	Fused-Quartz	Side-On	R306		R106 R106UH		
		Head-On			R292	R189	
	Borosilicate-glass	Side-On					
		Head-On				R580	R329 R464 R594(3")
	UV-glass	Side-On			R372		
		Head-On					
	Fused-Quartz	Side-On					
		Head-On					
	Borosilicate-glass	Side-On		R252			
		Head-On				R192	
	UV-glass	Side-On			R213 R270		
		Head-On					
	Fused-Quartz	Side-On			R136		
		Head-On				R207	R236
	Borosilicate-glass	Side-On			R554		
		Head-On					R550 RM55
	UV-glass	Side-On	R500		R446 R446UR		
		Head-On			R374 R453 R567	R592	
	Fused-Quartz	Side-On			R456		
		Head-On			R376 R457	R593	R375 R562
	Borosilicate-glass	Side-On			R406 (AgOCs)		
		Head-On			R316 (AgOCs)	7102 (AgOCs)	R473 (AgOCs)
	UV-glass	Side-On					
		Head-On					
	Fused-Quartz	Side-On	R427 (CsTe)		R166 (CsTe)		
		Head-On			R431 (CsTe)	R190 (CsTe)	

HTV-C447 and C448A are available for the regulated high voltage power supply in using photomultipliers and image dissector tubes.

Side-On Photomultiplier Tubes

Type	Replacement ※	Nominal Diameter (mm)	Dimensional Outline	Number of Stage	Spectral Response (Å)	Maximum Ratings ① Anode to Cathode Voltage (DC Volts)	Maximum Ratings ② Anode Current (mA)	Maximum Ratings Anode to Last Dynode Voltage (DC Volts)	Characteristics at 25°C and with Specified Supply Voltage ③ Cathode Sensitivity Typical Luminous Sensitivity (μA/Lm)	Cathode Sensitivity Typical Red ⑥ and White Light Sensitivity Ratio	Anode to Cathode Voltage ⑨ (DC Volts)	Anode Sensitivity Typical Luminous Sensitivity at 0 CPS (A/Lm)	Anode Sensitivity Typical Anode Radiant ⑧ Sensitivity (A/W)	Current Amplification	Typical Anode Dark Current (nA)
R300	RCA C70219H***	13	1	9	S-5	1000	0.01	150	30	–	1000	60	7.3×10^4	2.0×10^6	1.0
R306	RCA C70129C***	13	1	9	S-19	1000	0.01	150	30	–	1000	60	7.3×10^4	2.0×10^6	1.0
R427		13	1	9	1600~3200	1000	0.01	150	–	–	1000	4000 (A/W) ④	5.6×10^3	2.0×10^5	0.1
R500		13	1	9	1850~8500	1000	0.01	150	45	0.12	1000	100	9.0×10^4	2.2×10^6	5
PM57	Toshiba PM57*	19	2	3	S-4	500	0.01	150	40	–	400	0.003	2.9	7.5 x 10	0.05
R241		23	3	4	S-4	500	0.01	150	40	–	400	0.01	9.8	2.5×10^2	0.05
R252		23	3	4	S-10	500	0.01	150	40	–	400	0.01	5.2	2.5×10^2	0.5
931A	RCA 931A*	28	4	9	S-4	1250	0.1	250	30	–	1000	100	9.7×10^4	3.3×10^6	50
1P21	RCA 1P21*	28	4	9	S-4	1250	0.1	250	40	–	1000	150	1.5×10^5	3.8×10^6	2
R105UH		28	4	9	S-4	1000	0.1	250	50	–	1000	1500	1.5×10^6	3.0×10^7	20
1P28	RCA 1P28*	28	4	9	S-5	1250	0.1	250	40	–	1000	100	1.2×10^5	2.5×10^6	30
R212	RCA 1P28/V1** EMI 9661B**	28	4	9	S-5	1250	0.1	250	40	–	1000	120	1.5×10^5	3.0×10^6	2
R212UH	EMI 9781B **	28	4	9	S-5	1000	0.1	250	50	–	1000	1500	1.8×10^6	3.0×10^7	20
R372	RCA 1P28A/V1** RCA 1P28A**	28	4	9	1850~7300	1250	0.1	250	40	0.01	1000	120	1.4×10^5	3.0×10^6	10
R106	EMI 9665B** RCA 7200***	28	4	9	S-19	1250	0.1	250	40	–	1000	120	1.5×10^5	3.0×10^6	2
R106UH		28	4	9	S-19	1000	0.1	250	50	–	1000	1500	1.8×10^6	3.0×10^7	20
R450	RCA C31028**	28	6	9	S-4	800	0.1	150	60	–	600	3.0	2.9×10^3	5.0×10^4	5
R213	EMI 9664B**	28	4	9	1850~8000	1250	0.1	250	40	0.07	1000	80	4.0×10^4	2.0×10^6	75
R270	EMI 9663B**	28	5	9	1850~8000	1250	0.1	250	40	0.07	1000	80	4.0×10^4	2.0×10^6	75
R136	EMI 9670B**	28	4	9	1600~8000	1250	0.1	250	40	0.07	1000	80	4.0×10^4	2.0×10^6	75
R166		28	4	9	1600~3200	1250	0.01	250	–	–	1000	4000 (A/W) ④	5.6×10^3	2.0×10^5	0.1
R406	RCA C31004A**	28	4	9	similar to S-1	1500	0.01	250	20	0.04 ⑦	1250	4	3.7×10^2	2.0×10^5	50 ⑤
R446		28	4	9	1850~8500	1250	0.1	250	45	0.12	1000	100	9.0×10^4	2.2×10^6	10
R446UR		28	4	9	1850~9000	1000	0.1	250	50	0.18	1000	700	6.3×10^5	1.4×10^7	50
R554		28	6	9	3000~8500	800	0.1	150	45	0.1	600	3.0	2.3×10^3	6.7×10^4	5
R456		28	4	9	1600~8500	1250	0.1	250	45	0.12	1000	100	9.0×10^4	2.2×10^6	10

Conservation tube; R197

※ Replacement

*The same dimensional outlines, base connection and electric characteristics.

**The similar electric characteristics and the same dimensional outlines and base connection.

***The similar electric characteristics but different dimensional outlines or different base connection.

Notes:

① Ambient temperature: −80°C to +50°C.
② Average over any interval of 30 seconds max.
③ Using a tungsten-filament light source of 2854° K.
④ The light source is a low pressure mercury lamp with Fused-Quartz window (dominant radiating spectral line is 2537Å).
⑤ Measured with the supply voltage to give the anode luminous sensitivity of 2A/Lm.
⑥ Toshiba VR-68 sharp cut red filter (cut-off wavelength: 6500Å).
⑦ Toshiba IR-D1A infrared filter.
⑧ Measured at wavelength of max. response.
⑨ Voltage distribution:

Stage Number \ Electrode	K — DY_1 — DY_2 ------- DY Last — P
9	$\frac{1}{10}$ $\frac{1}{10}$ ---------- $\frac{1}{10}$
3	$\frac{1}{4}$ $\frac{1}{4}$ ---------- $\frac{1}{4}$
4	$\frac{1}{5}$ $\frac{1}{5}$ ---------- $\frac{1}{5}$

Head-On Photomultiplier Tubes

Type	Replacement ※	Nominal Diameter (mm)	Dimensional Outline	Number of Stage	Spectral Response (Å)	Maximum Ratings ① Anode to Cathode Voltage (DC Volts)	Maximum Ratings ② Anode Current (mA)	Maximum Ratings Anode to Last Dynode Voltage (DC Volts)	Characteristics at 25°C and with Specified Supply Voltage ③ Cathode Sensitivity Typical Luminous Sensitivity (μA/Lm)	Cathode Sensitivity Typical Red ⑦ and White Light Sensitivity Ratio	Anode to Cathode Voltage ⑩ (DC Volts)	Anode Sensitivity Typical Luminous Sensitivity at 0 CPS (A/Lm)	Anode Sensitivity Typical Anode Radiant Sensitivity ⑨ (A/W)	Current Amplification	Typical Anode Dark Current (nA)
R268	EMI 9524B *	28	7	11	S-11	1500	0.01	250	60	–	1000	150	1.2×10^5	2.5×10^6	3.0
R269	EMI 9601B *	28	7	11	S-21	1500	0.01	250	60	–	1000	150	1.2×10^5	2.5×10^6	3.0
R430		28	7	11	S-21	1500	0.01	250	60	–	1000	150	1.2×10^5	2.5×10^6	1.0
R292	EMI 9526B *	28	7	11	S-13	1500	0.01	250	60	–	1000	150	1.2×10^5	2.5×10^6	3.0
R374		28	7	11	1850~8500	1500	0.01	250	120	0.2	1000	50	2.0×10^4	4.2×10^5	2.0
R453		28	7	11	1850~8500	1500	0.01	250	60	0.1	1000	50	2.0×10^4	8.3×10^5	10.
R376		28	7	11	1600~8500	1500	0.01	250	120	0.2	1000	50	2.0×10^4	4.2×10^5	2.0
R457		28	7	11	1600~8500	1500	0.01	250	60	0.1	1000	50	2.0×10^4	8.3×10^5	10.
R567		28	8	4	1850~8500	1000	0.005	250	120	0.15	750	0.07	3.0×10	5.8×10^2	0.5
R316		28	7	11	S-1	1500	0.01	250	20	0.1 ⑧	1250	5	4.7×10^2	2.5×10^5	1000. ⑥
R431		28	7	11	1600~3200	1500	0.01	250	–	–	1000	4000 (A/W) ⑤	5.6×10^3	2.0×10^5	0.1
R546	Telefunken XP1080 **	28	8	4	S-11	1000	0.005	250	60	–	750	0.06	4.8×10	1.0×10^3	2.0
6199	RCA 6199 *	38	9	10	S-11	1250	0.1	250	50	–	1000	50	4.0×10^4	1.0×10^6	3.0
R580	Philips XP1010 *	38	10	10	3000~6500	1600	0.1	350	90	–	1250	35	3.5×10^4	3.9×10^5	3.0
R592		38	10	10	1850~8500	1250	0.01	250	120	0.2	1000	50	2.0×10^4	4.2×10^5	10.
R593		38	10	10	1600~8500	1250	0.01	250	120	0.2	1000	50	2.0×10^4	4.2×10^5	10.
R189		38	9	10	S-13	1250	0.1	250	50	–	1000	50	4.0×10^4	1.0×10^6	3.0
R192		38	9	10	S-10	1250	0.1	250	30	0.07	1000	30	1.5×10^4	1.0×10^6	100.
R207		38	9	10	1600~8000	1250	0.1	250	30	0.07	1000	30	1.5×10^4	1.0×10^6	100.
7102	RCA 7102 *	38	9	10	S-1	1500	0.01	250	20	0.1 ⑧	1250	4.5	4.2×10^2	2.3×10^5	1000. ⑥
R190		38	9	10	1600~3200	1250	0.01	250	–	–	1000	400 (A/W) ⑤	5.6×10^2	2.0×10^4	0.5
7696	Du Mont 6292 * Toshiba 7696 *	50	11	10	S-11	1500	0.1	250	60	–	1250	50	4.0×10^4	8.3×10^5	10.
R473		50	17	10	S-1	1500	0.01	250	20	0.1 ⑧	1250	4.5	4.2×10^2	2.3×10^5	1000. ⑥
R236		50	12	10	1600~8000	1250	0.01	250	40	0.07	1000	40	2.0×10^4	1.0×10^6	50.
R375		50	12	10	1600~8500	1500	0.01	250	120	0.2	1000	50	2.0×10^4	4.2×10^5	10.
PM55	Philips XP1002 * Toshiba PM55 *	50	13	10	S-20	1800	0.3	250	100	0.2	1500	50	2.0×10^4	5.0×10^5	20.
R550		50	13	10	S-20	1500	0.3	250	150	0.2	1000	50	2.0×10^4	3.3×10^5	10.
R562	EMI 9558 QB *	50	14	10	1600~8500	1500	0.01	250	120	0.2	1000	50	2.0×10^4	4.2×10^5	10.
R329	RCA 8575 *	50	15	12	3000~6500	2700	0.2	500	80	–	1500	50	5.0×10^4	6.3×10^5	1.0 ④
R464	RCA 8575 *	50	16	12	3000~6500	2500	0.01	500	50	–	1500	50	5.0×10^4	1.0×10^6	0.3 ④
R594	Du Mont 6363 * RCA 8054 *	76	18	10	3000~6500	2000	0.1	300	80	–	1500	30	3.0×10^4	3.8×10^5	10.

※ Replacement

*The same dimensional outlines, base connection and electric characteristics.

**The similar electric characteristics and the same dimensional outline and base connection.

Notes:

① Ambient temperature: −80°C to +50°C

② Averaged over any interval of 30 seconds max.

③ Using a tungsten-filament light source of 2854° K.

④ After 3 hours storage in darkness.

⑤ The light source is a low pressure mercury lamp with Fused-Quartz window (dominant radiating spectral line is 2537Å).

⑥ Measured with the supply voltage adjusted to give the anode luminous sensitivity of 4 A/Lm.

⑦ Toshiba VR-68 sharp cut red filter (Cut-off wavelength: 6500Å).

⑧ Toshiba IR-D1A infrared filter.

⑨ Measured wavelength of max. response.

⑩ Voltage distribution:

Stage Number \ Electrode	K — DY1 — DY2 ---------- DY Last — P	
11	$\frac{1}{12}$ $\frac{1}{12}$ ---------- $\frac{1}{12}$	※1 Focusing electrode voltage is adjusted to be the level that is approx. 1/2 of cathode-to-Dy_1 voltage.
4	$\frac{1}{5}$ $\frac{1}{5}$ ---------- $\frac{1}{5}$	※2 Focusing electrode voltage is adjusted to be the potential that is approx. same as the voltage of Dy_1. Multiplier shield is operated at Dy_5 potential.
10	$\frac{1}{6}$ $\frac{1}{12}$ ---------- $\frac{1}{12}$ ※1	
12	$\frac{4}{16.4}$ $\frac{1}{16.4}$ ---------- $\frac{1}{16.4}$ ※2	

Electron Multiplier Tubes

Type	Number of Dynode stage	Dimensional Outline	Dynode Material	Current Amplification at 250V/stage (Min)	Maximum Ratings ① Anode to First Dynode Voltage (DC)	Maximum Ratings ② Average Anode Current (μA)	Maximum Ratings ① Anode to Last Dynode Voltage (DC)
R474	16	–	Cu-BeO	4×10^7	5000	10	350
R515	16	19	Cu-BeO	4×10^7	5000	10	350
R596	16	–	Cu-BeO	4×10^7	5000	10	350
R595	20	20	Cu-BeO	1×10^{10}	6000	10	350

Dimensional Outlines and Basing Diagrams

① R300 R427 R306 R500

② PM57

③ R241 R252

④ 931A IP28 R106 R446etc.

⑤ R270

⑥ R450 R554

⑦ R268 R374 R376 R316etc.

⑧ R567 R546

⑨ 6199 7102etc.

⑩ R580 R592 R593

⑪ 7696

⑫ R236 R375

⑬ PM55 R550

⑭ R562

⑮ R329

⑯ R464

⑰ R473

⑱ R594

⑲ R515

⑳ R595

Vacuum Phototubes

Type	Dimensional Outline	Spectral Response (Å)	Maximum Ratings (Absolute Values)					Characteristics at 25°C		
			⑦ Anode Supply Voltage (volts)	Peak Cathode Current (μA)	Average Cathode Current Density (μA/sq-mm)	① Average Cathode Current (μA)	Ambient Temperature (°C)	Anode Supply Voltage (DC volts)	③ Typical Luminous Sensitivity (μA/Lm)	Max. Anode Dark Current (nA)
PV11	39	S-1	250	6	0.05	2	50	250	25	50
PV13	21	S-4	250	6	0.05	2	50	250	25	50
PV16	22	S-4	250	6	0.05	2	50	250	45	0.5
PV22	23	S-1	250	9	0.05	3	50	250	35	1
PV23	23	S-4	250	9	0.05	3	50	250	35	1
PV29A	24	S-1	250	30	0.05	10	50	250	30	1
PV31A	24	S-4	250	30	0.05	10	50	250	35	0.5
PV45	25	S-1	250	0.3	0.005	0.1	50	250	6 ④	5
90AV	26	S-4	100	6	0.0125	2	50	100	45	50
1P39	27	S-4	250	20	0.05	5	75	250	45	5
935	28	S-5	250	30	0.05	10	75	250	35	0.5
R110	29	S-19	250	9	0.05	3	50	250	35	1
R183	30	2000~6500	250	6	0.05	2	50	250	35	1
R310	29	1800~8000	250	9	0.05	3	50	250	45	1
R414	31	S-4	100	1	0.05	0.3	50	100	40	0.05
R369	27	2000~8000	250	6	0.05	2	50	250	35	5
R237	26	S-1	250	6	0.05	2	50	250	25	50
R403	32	2000~3200	250	4.8	0.05	1.6	50	250	20 ⑤ (mA/W)	1
R404	33	1800~3200	100	1.2	0.05	0.4	50	100		1
R314	27	2000~8500	250	1	0.005	0.1	50	250	20	0.05
R330	34	2000~8500	100	1	0.005	0.075	50	100	120	0.005
R424	35	S-20	100	1	0.005	0.075	50	100	120	0.005
R317	36	S-1	2500	1 (A)	–	50	75	250	15	50 ⑥
R518	41	2000~8200	250	1.5	0.01	0.1	50	250	45	0.5
R520	27	2000~8200	250	3	0.01	0.1	50	250	45	0.5

Conservation tubes: PV15, PV24, PV26, PV47, 929 and 5652

Gas-Filled Phototubes

Type	Dimensional Outline	Spectral Response	Maximum Ratings (Absolute Values)					Characteristics at 25°C			
			⑦ Anode Supply Voltage (volts)	Peak Cathode Current (μA)	Average Cathode Current Density (μA/sq-mm)	① Average Cathode Current (μA)	Ambient Temperature (°C)	Anode Supply Voltage (DC volts)	② Typical Luminous Sensitivity (μA/Lm)	Maximum Gas Amplification Factor	Max. Anode Dark Current (nA)
PG12	39	S-1	90	6	0.05	2	50	90	125	10	100
PG14A	21	S-4	90	6	0.05	2	50	90	200	8	100
PG25	37	S-1	90	9	0.05	3	50	90	180	7.5	100
PG27	38	S-1	90	9	0.05	3	50	90	180	7.5	100
PG28	37	S-4	90	9	0.05	3	50	90	135	5.5	100
90AG	26	S-4	90	6	0.05	2	50	90	150	7.5	100
4409	40	S-4	100	10	0.05	3	75	90	135	5.5	2
6953	42	S-1	90	9	0.05	3	100	90	200	10	2
R250	41	S-4	80	6	0.05	2	50	75	300	8	0.5

Conservation tubes: PG14, R121 and R193.

UVtron Tubes

Type	Dimensional Outline	Spectral Response (Å)	Maximum Ratings (Absolute Values)				Characteristics at 25°C			
			⑦ Anode Supply Voltage (Volts)	Peak Anode Current (mA)	Average Anode Current (mA)	Ambient Temperature (°C)	Operating Voltage (Volts, r.m.s)	Approx. Tube Drop Voltage (DC Volts)	Recommended Operating Voltage (Volts, r.m.s)	Average Recommended Operating Current (mA)
R259	44	2000~2900	420	10	3	−25~100	220 ± 10%	180	220	0.3
R184	43	1600~2900	575	10	3	−25~100	350 ± 10%	350	350	0.3
R334	44	1600~2900	575	10	3	−25~100	350 ± 10%	350	350	0.3

Notes:

① Averaged over any interval of 30 seconds maximum.

② On the basis of the tungsten-filament light source operated at 2854°K, dc anode supply voltage as indicated and a 1-megohm load resistor. A light input of 0.05 lumen is used.

③ On the basis of the tungsten-filament light source operated at 2854°K, dc anode supply voltage as indicated and a 1-megohm load resistor. A light input of 0.1 lumen is used.

④ Cathode luminous sensitivity is measured through the filter which passes only infrared radiation (Toshiba IR-D1A filter).

⑤ The light source is a low pressure mercury lamp with Fused-Quartz window (radiating spectral line is 2537 Å).

⑥ Measured at 2500 dc volts.

⑦ DC or peak AC.

Dimensional Outlines and Basing Diagrams

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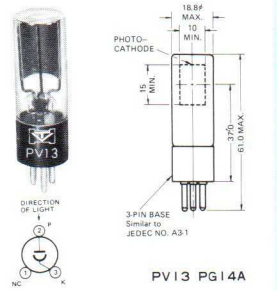

PV13 PG14A

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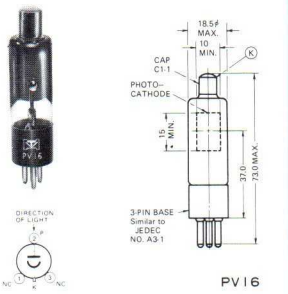

PV16

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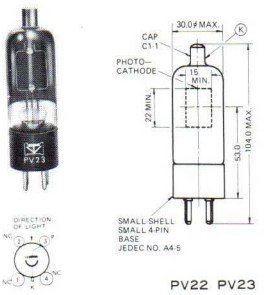

PV22 PV23

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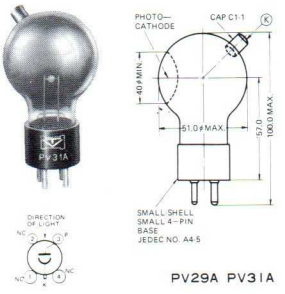

PV29A PV31A

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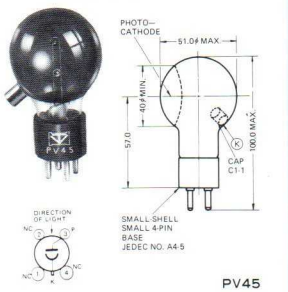

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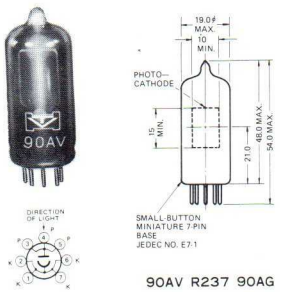

90AV R237 90AG

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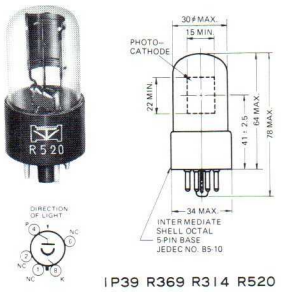

IP39 R369 R314 R520

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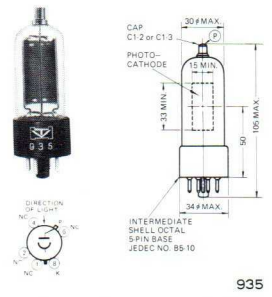

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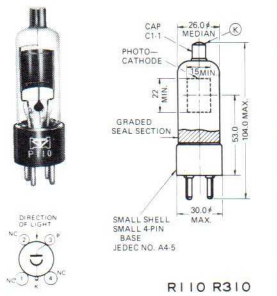

R110 R310

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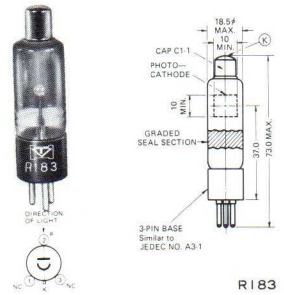

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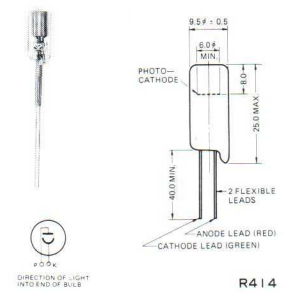

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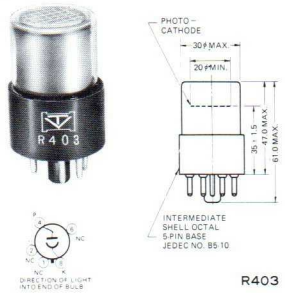

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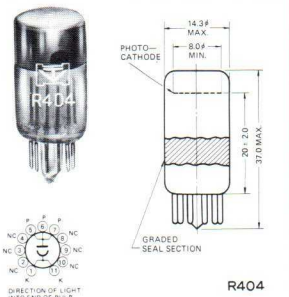

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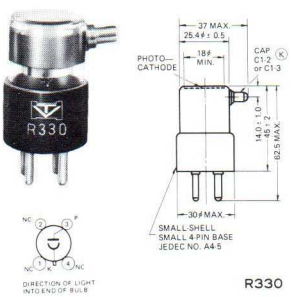

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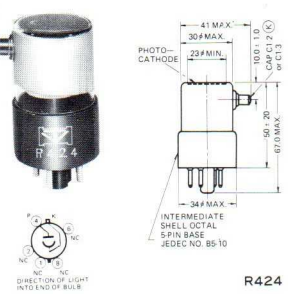

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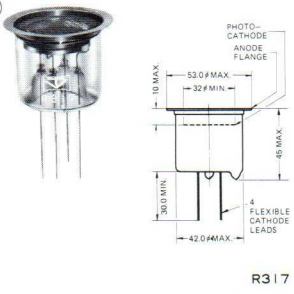

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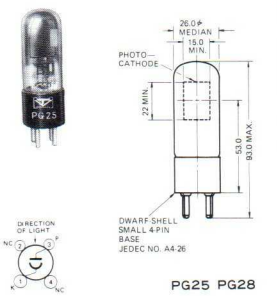

PG25 PG28

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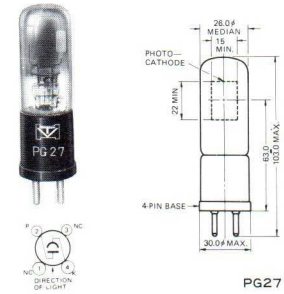

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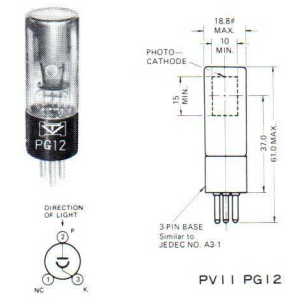

PV11 PG12

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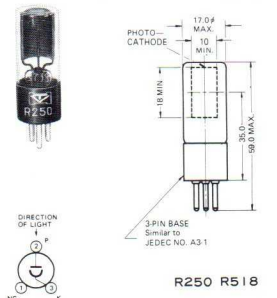

R250 R518

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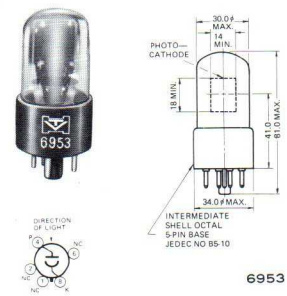

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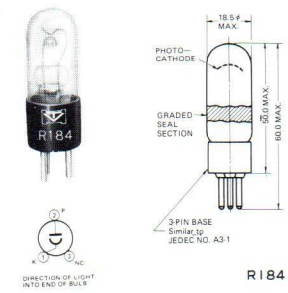

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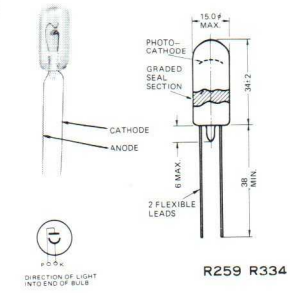


R259 R334

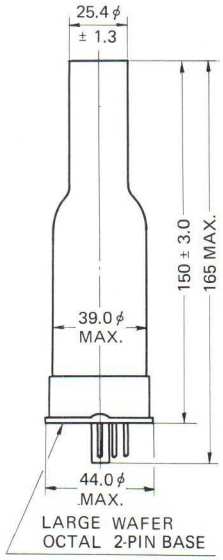
Hollow Cathode Lamps

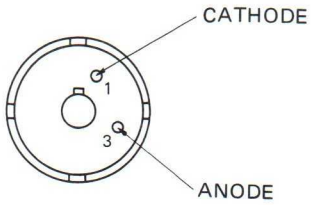
Element	Type	Fill Gas	Window Material ①	Tube Drop Voltage (V)	Maximum Current (mA)	Analysis Line (Å)	Optimum PMT	PMT Output ② (nA)	Appropriate Flame	Flame Conditions
Ag	L233-47NU	Ne	UV	180	20	3280.7 ※ 3382.8	R106	1250 835	Air-C_2H_2	STOICH.
Al	-13NU	Ne	UV	190	20	3092.7 ※ 3961.5	R106	1800 1600	N_2O–C_2H_2	RICH
Au	-79NQ	Ne	Q	230	16	2428.0 ※ 2675.9	R106	105 150	Air–C_2H_2	STOICH.
Ba	-56NB	Ne	B	130	25	5535.5 ※	R106	50	Air–C_2H_2 N_2O–C_2H_2	STOICH. STOICH.
Be	-4NQ	Ne	Q	170	35	2348.6 ※	R106	1100	N_2O–C_2H_2	STOICH.
Ca	-20NU	Ne	UV	210	18	4226.7 ※	R106	680	Air–C_2H_2 N_2O–C_2H_2	STOICH. STOICH.
Cd	-48NQ	Ne	Q	195	12	2288.0 ※	R106	260	Air–C_2H_2	STOICH.
Ce	-58NB	Ne	B	130	20	5200.2 5697.0	R446	50 50	N_2O–C_2H_2	RICH
Co	-27NQ	Ne	Q	180	30	2407.3 ※ 3465.8	R106	320 2000	Air–C_2H_2	RICH
Cr	-24NU	Ne	UV	160	30	3578.7 ※ 4254.4	R106	4400 4000	Air–C_2H_2	RICH
Cs	-55NB	Ne	B	180	20	8521.1 ※ 8943.5	R446	1.5 2.0	Air-Propane	STOICH.
Cu	-29NU	Ne	UV	205	20	3247.5 ※ 3274.0	R106	3700 2600	Air–C_2H_2	STOICH.
Fe	-26NQ	Ne	Q	170	30	2483.3 ※ 3719.9	R106	300 2500	Air–C_2H_2	RICH
Ge	-32NU	Ne	UV	195	20	2651.6 ※	R106	100	N_2O–C_2H_2	STOICH.
Hg	-80NQ	Ne	Q	180	6	2536.5 ※	R106	1100	Air–C_2H_2	STOICH.
K	-19NB	Ne	B	200	20	7664.9 ※ 7699.0	R446	115 105	Air–C_2H_2	STOICH.
La	-57NU	Ne	UV	130	20	3574.4 5501.3	R106	65 90	N_2O–C_2H_2	STOICH.
Li	-3NB	Ne	B	150	25	6103.6 6707.8 ※	R446	150 1750	Air-Propane	STOICH.
Mg	-12NU	Ne	UV	135	20	2852.1 ※	R106	1350	Air–C_2H_2	STOICH.
Mn	-25NU	Ne	UV	180	30	2794.8 ※ 4030.8	R106	1010 6000	Air–C_2H_2	STOICH.
Mo	-42NU	Ne	UV	140	30	3132.6 ※ 3208.8	R106	340 105	N_2O–C_2H_2 Air–C_2H_2	STOICH. RICH
Na	-11NB	Ne	B	150	20	5890.0 ※ 5895.9	R106	820 725	Air-Propane Air–C_2H_2	STOICH. STOICH.
Nb	-41NU	Ne	UV	150	30	3349.1 ※ 4058.9	R106	115 190	N_2O–C_2H_2	STOICH.
Ni	-28NQ	Ne	Q	200	25	2320.0 ※ 3414.8	R106	370 2000	Air–C_2H_2	STOICH.
Pb	-82NQ	Ne	Q	220	15	2170.0 ※ 2833.0	R106	30 300	Air–C_2H_2	STOICH.
Pt	-78NU	Ne	UV	190	30	2659.5 ※ 2998.0	R106	145 160	Air–C_2H_2	STOICH.
Rb	-37NB	Ne	B	165	20	7800.2 ※ 7947.6	R446	40 15	Air-Propane	STOICH.
Sb	-51NQ	Ne	Q	200	18	2175.8 ※ 2311.5	R106	45 55	Air–C_2H_2	STOICH.
Si	-14NU	Ne	UV	170	20	2516.1 ※ 2881.6	R106	200 160	N_2O–C_2H_2	STOICH.
Sn	-50NQ	Ne	Q	200	18	2246.1 ※ 2863.3	R106	35 155	Air–H_2 Air–C_2H_2	STOICH. RICH
Sr	-38NU	Ne	UV	135	25	4607.3 ※	R106	350	Air–C_2H_2 N_2O–C_2H_2	STOICH. STOICH.
Ti	-22NU	Ne	UV	160	35	3642.7 ※ 3653.5	R106	1250 1175	N_2O–C_2H_2	STOICH.
Ta	-73NU	Ne	UV	145	35	2714.6 ※ 2758.3	R106	105 50	N_2O–C_2H_2	STOICH.
V	-23NU	Ne	UV	170	35	3066.4 3184.0	R106	185 1350	N_2O–C_2H_2	STOICH.
W	-74NU	Ne	UV	155	35	2551.4 ※ 4008.7	R106	75 880	N_2O–C_2H_2	STOICH.
Zn	-30NQ	Ne	Q	195	18	2138.6 ※ 3075.9	R106	360 900	Air–C_2H_2	STOICH.
Zr	-40NU	Ne	UV	135	30	3601.2 ※ 4687.8	R106	390 575	N_2O–C_2H_2	STOICH.
D_2 Lamp	-1DQ	D_2	Q	390	40	Background Correction for Atomic Absorption Spectrophtometry				

① B: Borosilicate Glass UV: UV Transmitting Glass Q: Quartz
② Photomultiplier Tube (PMT): R106 · · · Sp=130A/Lm. R446 · · · Sp=230 A/Lm. HT: 600V. SBW: 1.6Å
※ Most Sensitive line

HTV-L233 series are completely sealed type hollow cathode lamps developed as light sources for the atomic absorption spectroscopy. Generally, Neon or Argon gas is used as the filled gas properly not to interfere with resonance lines, and Neon producing the strong line intensity is usually selected. The special base metal included in cathode gives the high spectral purity to the tubes, reduces the clean up phenomena and decreases remarkably the line of back ground, therefore they have the absorbance curves with excellent linearity at the low tube current and can be used for precise analysis. It is necessary to warm up the tubes for 10 to 15 minutes in order to operate with good stability.

Dimensional Outline



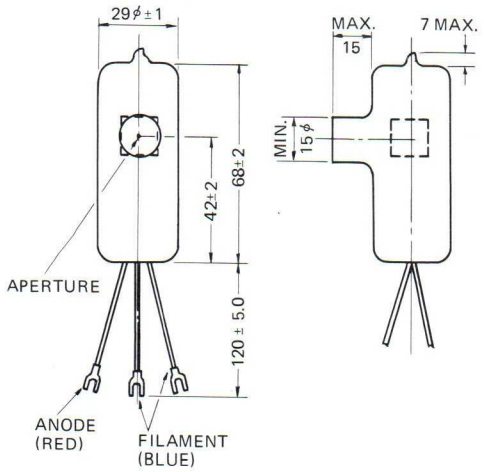


Deuterium Lamps

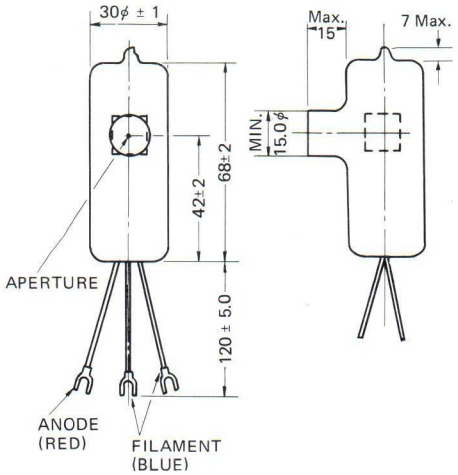
Type	General	Ratings						
	Emission Spectrum (Å)	Operating tube Current (DC A)	Operating tube Voltage (DC volts)	Operating Filament Voltage (DC or AC volts)	Warm-up Filament Voltage (DC or AC volts)	Warm-up Filament Current (DC or AC A)	Filament Warm-up Time (sec.)	Minimum Starting Voltage (DC volts)
L238	1600~4000	0.3	90 (approx.)	2 ± 0.5	4 ± 0.5	4.0 (approx.)	10	300
L544	1600~4000	0.3	90 (approx.)	3 ± 1	10 ± 0.5	0.8 (approx.)	10	300
L591	1850~4000	0.3	90 (approx.)	3 ± 1	10 ± 0.5	0.8 (approx.)	10	300

Dimensional Outlines

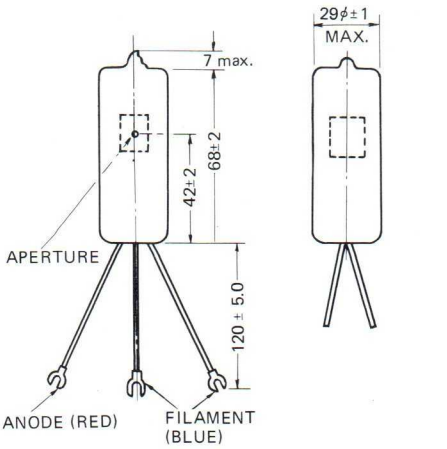
L238
(Fused Quartz Window)



L544
(Fused Quartz Window)



L591
(UV Transmitting Glass Window)



Photoconductive Cells

Type	Dimensional Outline	Maximum Ratings (Absolute Values) ①		Characteristics at 25°C ③				
				Cell Resistance			Time Response at 10 Lux ④	
		Voltage Between Terminals (Dc Volts)	Power Dissipation at 25°C (Watt)	0 Lux ② (MΩ) min.	10 Lux (KΩ) med.	100 Lux (KΩ) med.	Rise (msec.) med.	Decay (msec.) med.
P401	4M	100	0.03	10	30	4	60	20
P347	4M	100	0.03	300	400	50	15	10
P559	6M	200	0.05	0.5	5.7	1.4	100	140
P441	6M	200	0.05	2	11	2.3	45	30
P320	6M	200	0.05	10	70	10	60	20
P536	6M	200	0.05	10	33	4.2	45	30
P227D	6M	200	0.05	10	150	12	30	15
P227A	6M	100	0.05	1	8.5	1.5	170	130
P227E	6M	200	0.05	10	11	1.7	30	10
P227B	6M	100	0.05	10	100	14	25	20
P561	6M	100	0.05	10	4.5	0.67	30	10
P227C	6M	100	0.05	1	7	1	45	40
P440	6M	200	0.05	10	55	7.8	20	10
P551	6M	100	0.05	50	8.8	1.4	35	20
P285	6M	200	0.05	500	5500	275	10	2
P589	8M	200	0.1	10	5.5	1.1	45	30
P201D	8M	200	0.1	10	50	4	30	15
P467	8M	100	0.1	10	14	1.5	30	15
P534	8M	200	0.1	1	1.9	0.52	70	100
P201A	8M	100	0.1	1	5.2	1	170	130
P201E	8M	200	0.1	10	9	1.2	30	10
P501	8M	100	0.1	10	2.6	0.4	30	10
P199B	8M	300	0.1	1000	4400	560	25	20
P201B	8M	200	0.1	10	42	6	25	20
P487	8M	100	0.1	10	23	2.7	25	20
P489	8M	300	0.1	1000	820	100	25	20
P201C	8M	100	0.1	1	3	0.5	60	20
P203	8M	300	0.05	300	625	80	20	10
P204	8M	200	0.05	200	20	2	20	10
P346	8M	300	0.05	200	55	7.8	20	10
P368	8M	300	0.05	200	28.3	4.5	35	20
P380	8M	200	0.05	200	8.8	1.4	35	20
P411	8M	100	0.1	10	5	0.65	35	20
P560	8M	200	0.05	100	3.2	0.7	2	2
P295	8M	250	0.05	1000	800	13	10	2
P202	11M	150	0.3	5	2	0.36	80	40
P537	11M	300	0.3	20	17	2	60	30
P202A	11M	100	0.2	1	1.8	0.45	170	130
P202B	11M	200	0.2	5	35	4.5	25	20
P202C	11M	100	0.2	1	5	0.7	60	20
P322	14M	200	0.3	10	4.4	0.7	80	40
P586	5G	300	0.05	100	350	45	45	30
P587	5G	200	0.05	10	88	11	45	30
P141-2	12G	150	0.3	5	2	0.36	80	40
P255	15G	300	0.4	10	28	4.5	80	40
P575-1	6J	200	0.05	10	230	40	45	30
P578-1	6J	200	0.05	10	250	40	45	30
P576-3	13J	300	0.15	5	165	32.5	45	30
P579-3	13J	300	0.15	5	180	32.5	45	30
P577-2	24J	300	0.3	5	25	4.5	45	30

Notes:

① Ambient temperature for all types is −30°C to 60°C.
Tested with the sensitive surface of cell fully illuminated.
As the dissipation allowance decreases with the temperature increase it must not exceed one fourth of its value at maximum rating at 60°C.

② Measured after 60 seconds from removal of incident illumination.

③ For conditions where the light source is a tungsten filament lamp operated at a color temperature of 2854°K. This characteristic is determined after the cell has been exposed for a period of 16 to 24 hours to illumination of about 500 lux (white fluorescent light).

④ The time required for the conductance to rise to 63.2% of the maximum value, or fall from the peak to 36.8% of the maximum value.

PbS Cells

Type	Dimensional Outline	Envelope	Spectral Response (angstroms) ①	Useful Photosurface Area (mm x mm)	Maximum Voltage ④ between Terminals (dc volts)	Characteristics at 25°C		
						Sensitivity MIN. ② ③	Dark Resistance ② (MΩ)	Signal to Noise Ratio MIN. (dB)
P124	9G	All Glass	8000 ~ 25000	2 x 4	90	0.4	0.3 ~ 10	55
P394	9M	Glass Metal	8000 ~ 25000	1 x 5	90	0.6	0.3 ~ 2	55
P397	14M	Glass Metal	8000 ~ 25000	4 x 5	90	0.6	0.3 ~ 2	55
P506	17G	Sapphire window	7000~25000 7000~32000 * 7000~36000 **	1 x 10	90	0.8 14 * 14 **	0.03 0.3 * 3 **	65 70 * 65 **

Notes:

① Long wavelength cut-off:
Spectral point at which the response decreases to 30% of maximum.
By cooling the cell, it is possible to extend the spectral response to the longer wavelength.

② 5 volts are applied to each type.

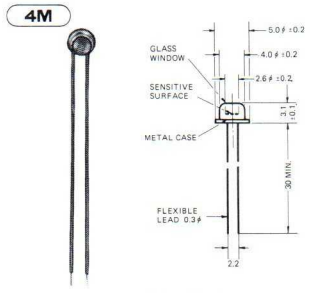
③ Sensitivity of the cell is defined by IL-ID/ID where IL is the photocurrent including the dark current represented by ID. The light source is a tungsten-filament lamp operated at a color temperature of 2854°K and light flux of 0.1 holo-lumen/sq-cm is used.

④ Absolute values. The maximum ambient temperature rating of these cells is 60°C.

⑤ * at −78°C ** at −196°C.

Dimensional Outlines

4M

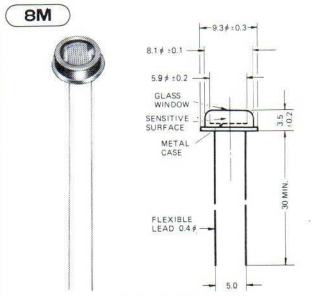


P401 P347

6M

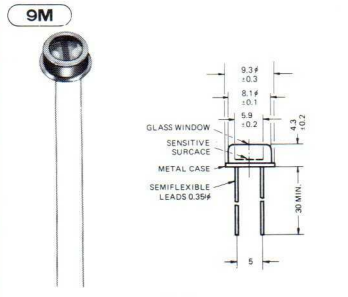
P441 P320 etc.

8M



P201B P346 etc.

9M

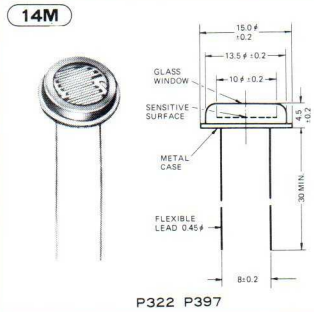


P394

11M

P202A P202 etc.

14M

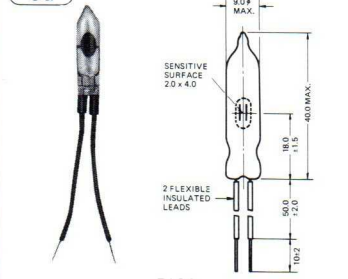


P322 P397

5G

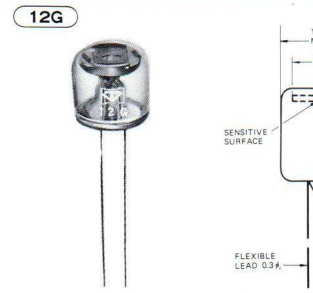
P586 P587

9G



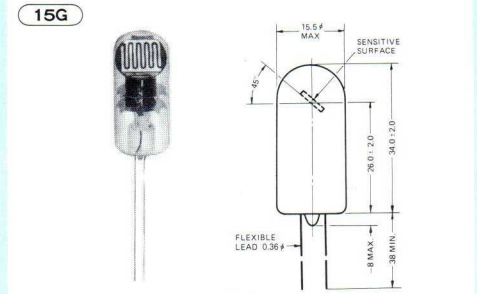
P124

12G



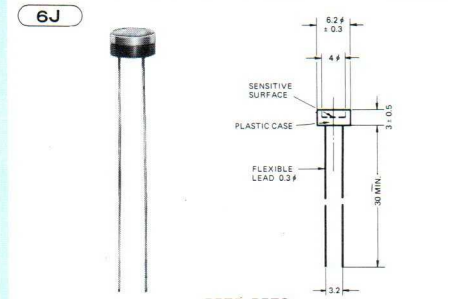
P141

15G



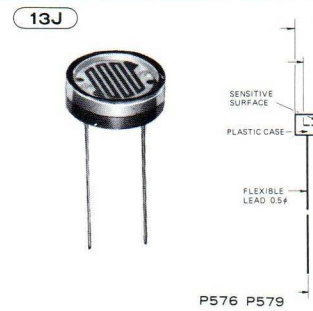
P255

6J



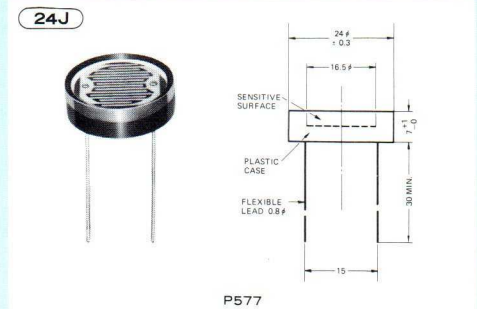
P575 P578

13J



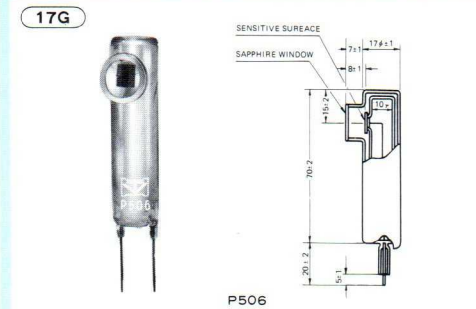
P576 P579

24J



P577

17G



P506

Lamp - Photocells

TYPE	Control (lamp)		Signal (Photocell)					
			Resistance		Maximum Ratings		Time Response②	
	Voltage (Vdc)	Current (mA)	On (Ω)	Off① (MΩ)	Voltage (V)	Power Dissip.④ (mW)	On med. (msec.)	Off med. (msec.)
P388-W3-380	3	15±2	500±250	10	200	50	40	20
P388-W6-380	6	15±2	300±150	10	200	50	40	20
P388-W10-380	10	18±2	200±100	10	200	50	30	20
P388-W10-552	10	18±2	50± 25	10	100	100	30	20
P392-W1.5-380	1.5	15±2	500±250	10	200	50	40	20
P392-W1.5-411	1.5	15±2	300±150	1	100	100	40	20
P392-W3-380	3	15±2	400±200	10	200	50	40	20
P392-W5-569	5	30±3	150± 75	10	200	50	30	20
P392-W10-380	10	12±2	150± 75	10	200	50	30	20
P388-N100-295	100(ac)	1.5(ac)	5000±2500	100	200	50	5	5
P388-N100-380	100(ac)	1.5(ac)	500±250	10	200	50	10	10
P388-N100-411	100(ac)	1.5(ac)	200±100	1	200	100	10	10

LED-Photocells

TYPE	Control (LED)			Signal (Photocell)				
	Maximum Ratings			Resistance		Maximum Rating	Time Response②	
	Reverse Voltage (V)	Forward Current (mA)	Power Dissipation④ (mW)	ON③ (KΩ)	OFF① (MΩ)	Power④ Dissipation (mW)	ON med. (msec)	OFF med. (msec)
P588-G50-201B	3	50	100	1.5±0.75	10	50	1.5	0.4
P588-G50-552	3	50	100	0.1±0.05	10	100	5.0	2.0

LED-SPD Coupling Elements

TYPE	Control (LED)			Signal (S.P.D)			Time Response②	
	Reverse Voltage (V)	Forward Current (mA)	Power④ Dissipation (mW)	Photo③ Current med. (μA)	Dark Current med. (μA)	Open③ Voltage med. (mV)	ON med. (msec.)	OFF med. (msec.)
P604-G50-598	3	50	100	6	1	250	6	6

Notes:

① Minimum values. Measured after 10 seconds from turned off of the lamp.

② The time required for the conductance to rise to 63% of the maximum value, or fall from the peak to 37% of the maximum value. (P604-G50-598 Forward current=50 mA, Load resistance=1KΩ)

③ Forward current=50 mA.

④ at 25°C.

Video Equipments

Features of Video Equipment

1. Measuring with no contact.
2. Non-destructive measuring.
3. Simultaneous measuring and observation.
4. High-speed response, real time measuring.
5. Continuous analogue output signal.
6. Easy to operate in combination with the servo system.
7. Measuring in the good accuracy.
8. Adaptability to any system with the proper selection of the optical system.

Video Analyzer: For Measuring in One Dimension	C525	Static and dynamic measuring along vertical axises (Y-axis). Easy to set three sampling lines (parallel to Y-axis) to the measuring points on the picture monitor. Individual data from each sampling line. Setting of the light-level in the circuit makes it possible not to put on any target mark on the object in general use.
	C279	Same type as C525, adaptable up to 3 plug-in units and camera heads. Installation of camera heads and plug-in units allows up to nine points of measuring. Simultaneous measuring of three dimensions when equipped fully.

Applications:

1. For measuring the wobbling of the high voltage power-transmission wire or trolley wire.
2. For measuring the wobbling of long size structures, suspension bridge, tower, etc.
3. For the observation or position detector of the moving object.
4. For measuring the bending, distortion and deviation.

X-Y Analyzer: For Measuring in Two Dimensions	C583	Measuring of the brightest point in the monitor picture. X and Y output voltages in the co-ordinate, centering the origin on the center of the picture. A point mark indicates the measuring point in the picture.
	C420	Same type as C583, adaptable up to 3 plug-in units and camera heads. Installation of camera heads and plug-in units allows up to three dimensions of measuring.
	C527	Measuring of a selected target mark from plural numbers using a light pen. Employing a "Gating method" around the target, enables to track only the selected target. Output voltage in the X-Y co-ordinate, centering the origin on the center of the picture. The point mark and framing mark for the measuring point.

Applications:

1. For the robot-eye in the manufacturing process.
2. For the automatic tracking system of the flying object in combination with the servo system.

X-Y Tracker: For High-speed Tracking	C426	With the electrostatic type image dissector tube (R312). Sampling rate of 15.75 KHz. Automatic··· automatic tracking of the brightest point. Manual··· tracking of a selected bright point with a light-pen, from plural numbers of bright points. Output voltage in the X-Y co-ordinate, centering the origin on the center of the picture.

Applications:

1. For measuring the eccentricity and distortion of the rotating and vibrating objects.
2. For measuring the locus of the high-speed object, and for the automatic tracker controlled with the servo system.
3. For measuring the wobbling and shock.

Area Analyzer: For Area Measuring	C507	Area and its variation of the object. Easy to apply for any shape and size of the object, or even it is moving.

Applications:

1. For quality controlling or automatic controlling of the shape and size in the manufacturing process.
2. For measuring the cutting area of paper or sheet, etc.

Infrared TV Cameras: For the Infrared Range	C158	Utilizing the infrared sensitive vidicon tube (N156). With the delay sweep trigger circuit for line selecting and the line indicator.

Applications:

1. For observation, guard or crime prevention in the dark.
2. For detecting the thermal pattern of the heating object (more than 300°C)
3. For observing the oscillating condition of laser in the infrared range.
4. For observing the internal construction of the semi-conducter, silicone, germanium, etc.
5. For the optometry in the ophthalmic hospital or observation of the seriously wounded in the general hospital.

Storect Vision: For Analyzing The One Shot of The Scene	C469	Utilizing the image memory tube (N333). Automatic exposing from 0.1 to 50 msec, using electronic shutter. Easy to select the shutter chance, simultaneous exposing of a frame. A picture on the monitor, lasting for approximately two minutes with the standard scanning method. Option··· a specially designed "wobbling correction circuit" can be installed for obtaining an instant and still image of the moving object (rectangular to lens axis of a camera).

Applications:

1. For obtaining intermittent and still images of the high-speed object.
2. For quality controlling of the product in the high-speed manufacturing process.
3. For analyzing the high-speed object in combination with the strobo light.

Image Pickup Tubes and Memory Tubes

Type		Diameter (mm) (inch)	Overall length (mm)	Characteristics	Applications
Image Dissector Tubes					
 R571	R571	38 (1½)	182	Magnetic Type. Various sizes of the aperture. S–20 photocathode (S–10, S–1, and others). 1 x 10^6 current amplification. Slow scanning.	Observation of the high speed moving or rotating object. Sensors of O.C.R. in the computer. Two-dimensional measurement equipment.
	R312	38 (1½)	222	Static Type. Various sizes of the aperture. S–20 photocathode (S–10, S–1, and others).	
Memory Tubes					
 N232	N232	25 (1)	210	Magnetic Type. Non-destructive read-out. Read duration longer than 2 min. 1 TV frame writing speed. 2 TV frame erasing time.	Scan convertor, Alphanumeric computer console, Interactive graphic displaying. Educational TV console, Information storage and retrieval systems.
	N319	50 (2)	263		
Image Memory Tubes					
 N337	N337	38 (1½)	179	Magnetic Type. Grid control type written by the light of the image of the scene. S–20 photocathode (S–10, S–1, and others). Non-destructive read-out. Electronic shutter. Slow scanning.	Optical information storage and retrieval systems. Space applications.
	N333	50 (2)	265		
X-Ray Vidicons					
 N350	N350	25 (1)	159	Magnetic Type. Beryllium faceplate.	Observation of the image in the X-ray. Non-destructive inspection X-ray diffration.
	N400	38 (1½)	195		
Infrared Vidicons					
 N156	N156	25 (1)	159	Magnetic Type. Threshold wavelength at 2.4 μ.	Noct vision. Observation and measurement of temperature of more than 200°C. Observation of the dislocation, laser pattern and hydrogen frame.
	N157	25 (1)	130		
 N177	N214	25 (1)	159	Magnetic Type. Threshold wavelength at 2.4 μ. High resolution.	
	N177	25 (1)	159	Static Type. Threshold wavelength at 2.4 μ.	

MAIN PRODUCTS OF HAMAMATSU

Head-On Photomultiplier Tubes
Side-On Photomultiplier Tubes
Electron Multiplier Tubes

Phototubes
Hollow Cathode Lamps
Deuterium Lamps
Light Modulation Lamps
UV trons

CdS Cells
PbS Cells
Lamp-Photo Cells
Multi-channel CdS Cells

Infrared Vidicon Tubes
X-Ray Vidicon Tubes
Image Dissector Tubes
Image Memory Tubes
Memory Tubes

Video Analyzer
X-Y Analyzer
X-Y Tracker
Area Analyzer
Iriscorder
Infrared TV Cameras
Storect Vision

Regulated Power Sources

PHOTON IS OUR BUSINESS

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