Development of High Performance Color TV Camera Tube
—"SATICON"—

an Article from

RESEARCH AND DEVELOPMENT IN JAPAN
AWARDED
THE OKOCHI MEMORIAL PRIZE

1978

NHK (Japan Broadcasting Corporation) Technical Research Laboratories
1-10-11 Kinuta Setagaya-ku Tokyo 157, Japan

HITACHI Hitachi, Ltd. Electron Tube Division
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Dr. Masatoshi Okochi's Life and Work (1878-1952)

Dr. Masatoshi Okochi in his later years.

The Institute of Physical and Chemical Research (Rikagaku-Kenkyusho) was established in Japan in 1917. Viscount Masatoshi Okochi, Doctor of Engineering and Professor of Tokyo Imperial University, was selected in 1921, at the age of forty-three, as the third President of the Institute and held the post for twenty-five years, until 1946. Under his capable administration, designed to provide optimal conditions for the advancement of research, the Institute came to house nearly all of Japan's eminent scientists and engineers, and drawing on his resourcefulness and practical powers to the fullest, it was able to overcome the mounting financial needs.

In becoming the greatest center for research in the Orient, the Institute not only assured continued progress for Japan in the physical, chemical and engineering fields, but also functioned as an important training center for a large number of scientists and engineers.

In a country poor in natural resources as well as weak in various areas of industry, Dr. Okochi championed scientific progress and the creation of new resources under the slogan of "Japan: A 'Have' Nation". Moreover, in order to industrialize the inventions stemming from research at the Institute, he founded in succession a group of sixty-three enterprises. The courageous effort required to develop these research works into industrial production was characteristic of Dr. Okochi's work. The process of industrial innovation at that time involved many more difficulties than it does today, but eventually a portion of the profits earned by the group of companies he had established came to cover all of the Institute's enormous expenditures.

Though scientific development and industrial innovation suffered an enormous setback because of the War, Dr. Okochi will always remain an outstanding pioneer in the history of science and technology in Japan.

Born into an aristocratic family, he was awarded an Imperial Award from the Imperial Invention Association in 1933 for working out the piston ring manufacturing method, and again in 1938 for the magnesium manufacturing method. A man with a keen mind, he was at the same time a gourmet, a connoisseur of the arts and beauty. He was extremely fond of Japan's ancient art objects, particularly chinawares, and often lectured thereupon to groups of foreigners.

History of the Okochi Memorial Foundation

In 1954, two years after the death of my respected teacher, Dr. Masatoshi Okochi, the Okochi Memorial Foundation was set up for the purpose of promoting science and technology for industrial production. Dr. Okochi had pointed out in the 1930's that Japan lagged conspicuously behind other countries in this area. In honoring the spirit of Dr. Okochi, the Foundation chose this as the basis for its memorial enterprise.

The year after its establishment, the Foundation embarked on the program of selecting a designated number of the most brilliant individuals, groups and organizations among the many whose research work in the field of science and technology for industrial production had been highly estimated. Since that time eight hundred sixty-five superior researchers have been distinguished by the annual Okochi Memorial Prize. In order that the award should not become merely a passing phenomenon, a "Society of Fellows" has been set up by the Okochi Prize Winners. Each year a social gathering of members of both the Foundation and the Society of Fellows is held, as well as activities such as inspection tours and lecture meetings. The Foundation obtains from the recipients an accurate outline of as much of their achievements as they wish to disclose. Every year it publishes a volume of these descriptions, which is read and used widely throughout Japan.

For the first thirteen years of the Foundation's existence, Dr. Jiro Tsuji, an eminent scholar in the field of applied physics and photo-elasticity, served as Chairman of the Board of Trustees. In 1968, Dr. Tsuji was succeeded by Dr. Makoto Okoshi, a distinguished scholar in the field of precision engineering. In 1969, Dr. Yoshitoshi Oyama, an eminent scholar in the field of chemical engineering, served as chairman. In 1977, I was appointed to the position. Besides the President and Chairman of the Board, there are twenty-five Trustees, including five Standing Trustees. Also assisting with the work of the Foundation are two auditors and thirty-six influential advisors from political, financial and academic circles.

The number of organizations striving to promote scientific and technological development has increased in Japan in recent years. The Okochi Foundation has been the pioneer in this effort, dating back to the early postwar years. I would like to express my gratitude to all the officials and committee members of the Foundation who donate their time and enthusiasm to its work.

Foundation has been publishing an English language edition of the recent achievements of those awarded the Okochi Prize. We feel this is appropriate for the present age, when the nations of the world need to cooperate and progress together.

Yoshio Suge
Chairman
Board of Trustees

* * * *

The Okochi Memorial Prize

The award is divided into two categories: Those given to individuals or groups of researchers, and those given to enterprises or research organizations. A Grand Prize is specially awarded in each of these classifications.

1. Individual or group prizes:

Technology Prize

(Six or less per year) is conferred on scientists and engineers for their excellent works in the area of science and technology for industrial production. The achievements include study for the industrialization of those works. The prize carries a monetary gift of 300,000 yen and a medal designed by a leading artist, the late Fumio Asakura.

Grand Technology Prize

(generally one per year) is awarded to a distinguished person who are considered to have made the greatest contribution in the said area toward scientific and technological progress. It is also accompanied by a gift of one million yen and a medal.

2. Prızes awarded to companies and institutions:

Production Prize

(Six or less per year) is awarded to companies, laboratories and research divisions of companies for their outstanding achievements in establishing new industrial areas or manufacturing processes based on good results of scientific and technological study for industrial production.

Grand Production Prize

(one per year) especially honors an organization for its eminent results and great contribution toward scientific improvement in the forgoing field.

The recipients of both Production and Grand Production Prizes are given certificates and large trophies designed by Fumio Asakura.

* The prizes are conferred each year in mid-March by tbe President of the Foundation. Other dignitaries, such as the Minister of International Trade and Industry, the Director General of the Science and Technology Agency, the Chairman of the Japan Science Council and the President of the Invention Association usually participate in the presentation.

* The annual prize winners are chosen by judging committee of twenty-eight specialists recommended by the Board. This committee conducts extensive investigations lasting about four months, going through documents and interview and visiting factories to obtain the most precise possible confirmation before they make final decision.

* Candidates for the Okochi Memorial Prize are recommended every year, at our request, from laboratories, research institutes, universities, academic circles, etc. all over Japan. The number of candidates is several times greater than the number of prize winners. The Okochi Memorial Prizes, which stresses "industrialized innovations" as its object, is highly appreciated in Japan.

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* A Note on Publication of This Book

by Osamu Taniguchi
Chairman, Publication Committee

Work on the publication of this book began eight years ago. Members of the Committee on Publication include Dr. Osamu Taniguchi, Dr. Saburo Suzuki, Dr. Yasuo Mori, Dr. Goro Ito, Dr. Tohru Motooka (members of the judging committee), and Takashi Ando.

Outlines of all achievements receiving an award in fiscal 1976, a total of fourteen are given

Responsibility for the description of the prize winning research is held by each prize winner.

I would like to express my appreciation to the members of the Committee on Publication and to all the prize winners for providing English summaries of the work. Special thanks go to Fuji Marketing Research Company (publisher of "TECHNOCRAT" magazine) for preparing this book.

★ The achievements described within each category of the awards are listed in no particular order.

★ The corporations in which these projects were carried out are briefly introduced on pages 90 to 97 of this issue. If further information about these projects is desired, requests should be sent directly to the corporation concerned.

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GRAND PRODUCTION PRIZE

Development of High Performance Color TV Camera Tube —"SATICON"* —

NHK Technical Research Laboratories

Hitachi, Ltd.

1. Introduction

The progress of television can be described as the history of camera tubes and TV cameras, since considerable difficulties had to be overcome to obtain practical camera tubes which had adequate sensitivity and high picture quality. Both the present color TV age as well as the former black-and-white TV age owes much to advances in camera tubes.

In 1960, when color TV broadcasts had just begun, the color camera head weighed as much as one hundred kilograms, while the present hand held camera, which can be carried by a single person, weighs only several kilograms.

Up to now, the "live" color cameras used in broadcasting have been mainly equipped with the plumbicon tube, with prices as high as forty thousand dollars. The plumbicon photoconductive surface is made of lead monoxide, which although this offers high performance, has such a complicated production process that it has been difficult to reduce the cost. The vidicon, on the other hand, is a camera tube for general use, whose photoconductive surface is antimony trisulfide. This has the demerit of a long decay lag, but can be produced at low cost. In demand for some time therefore has been a broadcast-class high-performance camera tube capable of good mass-production.

Our new product, the high-performance camera tube *SATICON* (Photo 1) is only 2/3 inch in diameter, yet offers better performance than the ordinary 1-inch camera tube in broadcast use, and it has been playing a leading role in current hand held color cameras. Its applicability to simple single-tube color cameras and its good mass-producibility are expected to lead to an increase of its market in the industrial and domestic sectors as well.

2. Aim of the Research

The development of *SATICON* was started around 1965. NHK Technical Research Laboratories, who had been looking

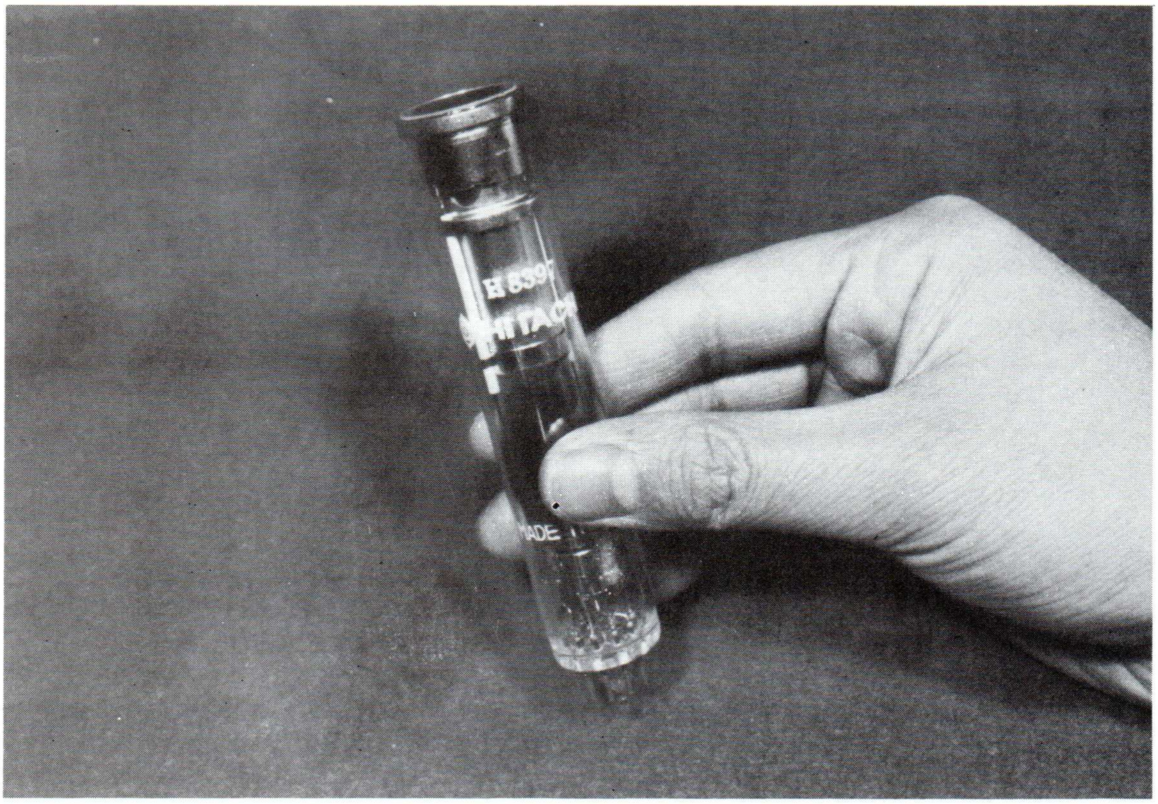

Photo 1. 2/3-Inch *SATICON*

* Trademark

for new photoconductive materials for camera tubes, found that an excellent response speed and high sensitivity to visible light could be obtained with a complex photoconductor film oomposed of a thin selenium layer and an arsenic triselenide layer. Like the plumbicon, whose target is a reverse-biased p-i-n structure of lead monoxide, this photoconductor film also has a "blocking" structure where the injection of holes is stopped at the selenium layer. The blocking type target has advantages over the "injection" type such as a lower dark current, faster photo-response and higher quantum efficiency. In order to realize this new blocking type camera tube, a cooperative research contract was made between NHK and Hitachi.

3. Progress of the Research

On examining the arsenic triselenide target, it became clear that it had an intrinsic demerit of "burning" when exposed to a bright image. This effect was due to a too low electron mobility in the arsenic triselenide, and could not be eliminated without replacing this material with a more suitable one. Thus, a selenium-rich chalcogenide glass was chosen.

Selenium and selenium compounds were known to be excellent photoconductors, but their physical and chemical properties had not been well understood and knowledge about the effects of small impurities and about the prevention of crystallization of selenium was limited. The TV camera tube must satisfy a variety of requirements such as lag, resolution or sensitivity, so our research project had to deal with both the target structure and the material properties themselves.

As a result of this research work a new photoconductive camera tube was realized using a selenium-arsenic-tellurium glass photoconductor, in which the arsenic was added to increase thermal stability and tellurium to increase the red sensitivity of the selenium. This tube has been named *SATICON*, and was made public by newspaper in 1972.

A selenium-target photoconductive camera tube was once investigated by RCA, but not developed since they could not solve the crystallization problem. This has now been solved by choosing a proper distirbution of arsenic and tellurium. As this photoconductor shows much better resolution than lead monoxide, we aimed at developing a 2/3-inch, small-sized camera tube for color cameras which would match and possibly exceed the resolution and registration of the conventional camera tube in broadcast use. In order to accomplish this, we also have developed high accuracy electrodes and coil assembly, and a high-resolution focusing system as well as a mass-production process for the target and a new "low lag gun".

Moreover, the *SATICON* target is being adopted in many types of camera tubes in single tube color TV cameras.

4. Specific Features of the Research

Figure 1 shows the schematic structure of the *SATICON* target. Accumulated on a glass faceplate are a thin oxide electrode, a selenium-arsenic layer, a selenium-arsenic-tellurium layer, a selenium-arsenic layer and an antimony trisulfide layer. The first three letters of *SATICON* stand for Selenium, Arsenic and Tellurium. Selenium-containing chalcognide glass is an amorphous semiconductor which has been attracting attention in recent years. Although its electrical and optical properties are semiconductive, it has been difficult to obtain rectifying contacts such as p-n junctions or Schottky barriers with this material due to the high localized state densities. We learned that a selenium-rich chalcogenide glass can form a hetero-junction with tin oxide, and succeeded in obtaining a large-area photo-diode. To increase red sensitivity needs to dope tellurium component in Selenium, which acts as a red enhancer. But doped tellurium increases unfortunately undesired localized state-densities. So it is added only to the necessary portion of the film as shown in Fig.1. As it is also possible to optimize spectral photo-response by controlling the tellurium content, the spectral sensitivity of *SATICON* is designed to be optimum for color TV use as shown in Fig.2.

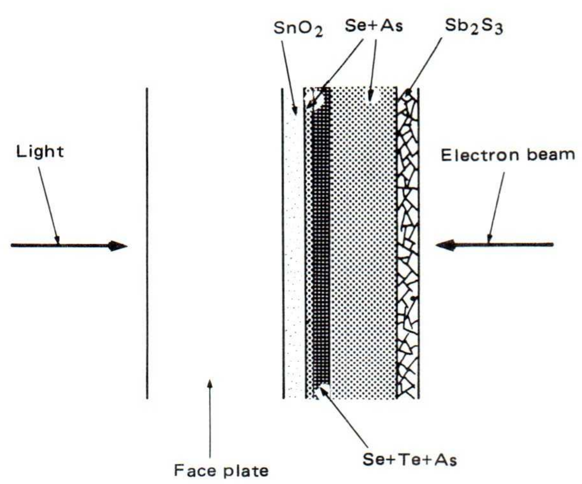

Fig. 1. Schematic Target Structure of *SATICON*

As is shown in Fig. 3, the amplitude modulation of the 2/3-inch *SATICON* is as good as the 1-inch broadcast camera tube, and thus it has played a leading role in the miniaturization of TV cameras.

The photoconductive layer of *SATICON* is produced by vacuum evaporation. We have developed a new multisource evaporation process which enables accurate control of the components. The characteristics of *SATICON*, such as sensitivity, lag, resolution, etc., are therefore quite reproducible and well controlled. And since this photoconductive layer is stable in air, it is easy to handle and suitable for mass production.

The scientific as well as technological significance of *SATICON* development is as follows.

Firstly it has realized a large-area amorphous semiconductor photo-diode.

Secondly, a new high-accuracy vacuum evaporation process has been developed, through which a particular distribution of the component materials can be realized.

Thirdly, in connection with *SATICON* tubes, mechanically accurate electrodes and coil assembly have been developed. And they helped greatly in giving high reliability to the *SATICON* tube.

Fourthly, using a computer simulation, a low lag gun was realized with the *SATICON* photoconductive layer and this will be applicable to the improvement of the lag characteristics of other camera tubes. Generally the lag characteristics of a camera tube are determined by not only the electron gun and Yoke assembly but also the photoconductive layer. And it has been hard to separate the effect of electron gun design from the improvement of lag characteristics in camera tubes due to the poor reproducibility of conventional photoconductive layers. The *SATICON* photoconductive layer on the other hand has a high reproducibility, and this has made it possible to use computer simulation in gun and Yoke assembly design work and so obtained high performance *SATICON* tube components.

5. Results of Research

SATICON has promoted the miniaturization of color TV cameras for broadcast use, and small cameras for electronic news gathering systems have thus been realized. The picture quality of these cameras is comparable to that of the standard type cameras, so they are being used not only in news gathering but also for location production of dramas (Photo 2). *SATICON*'s good producibility and stability are expected to expand its market from broadcast use to the industrial and domestic sectors. Small sized simple color *SATICON* cameras for home VTR will improve picture quality.

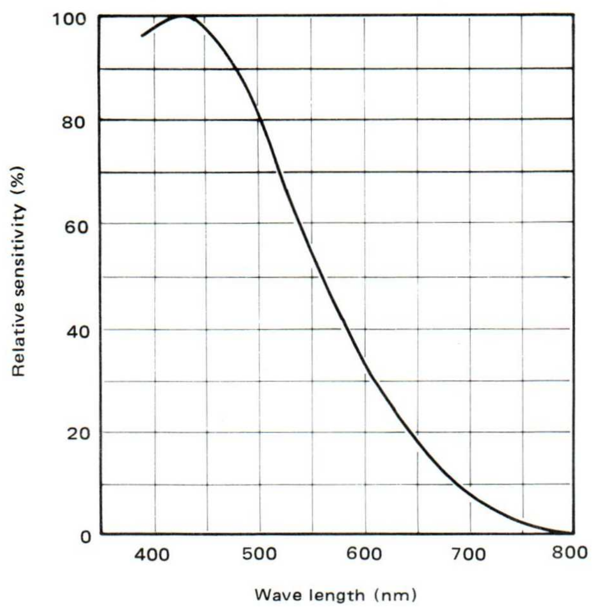

Fig. 2. Spectral Photosensitivity of *SATICON*

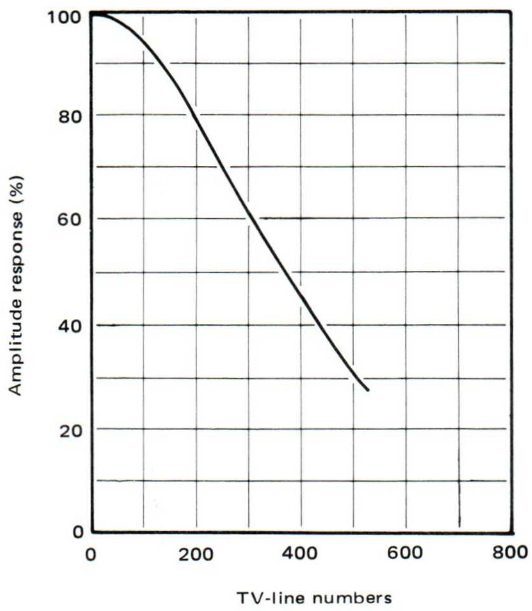

Fig. 3. Amplitude Response Characteristics of 2/3-inch *SATICON*

Photo 2. Broadcast Use Hand Held Camera Equipped with *SATICON*

Since 1974 when the *SATICON* first appeared, more than 10,000 units have been produced both for broadcast and industrial use, and production has been increasing rapidly. Its basic structure and production technology have been patented in six countries including the U.S.A. and Japan, and licensing contracts concluded with Sony and with RCA in 1977. *SATICON* has been highly acclaimed in the business world. It won an IR100 1976, Broadcast Cultural Fund Award 1976, Niwa-Takayanagi Award of the Society of Television Engineers 1977 and now has received the Ohkochi Memorial Prize.

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7. Conclusion

SATICON has initiated the trend toward miniaturization of broadcast cameras and remarkably increased the mobility of program production. It gives us the hope of getting high quality pictures not only in broadcast use cameras but in industrial and home use cameras as well. Home use VTRs are now taking off in the market, and in the near future people will enjoy "home-made" VTR tapes just like the present 8mm movie films. The merits of long-period recording and instant play-back will find new applications for color TV.

The amorphous semiconductor photo-diode of the target has potential as a large area photo-receptor. This potential has been exploited already as a contact type linear photosensor for facsimile. The practical utilization of the *SATICON* will promote applications of this large area amorphous photosensor in many ways.

HITACHI SATICON®

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HITACHI SATICON

INTRODUCTION

SATICON is an epoch-making new type of tube, that has a photo-sensitive layer of a hetero-junction structure made up of an amorphous semiconductor material and a conductive tin oxide layer.
The name SATICON comes from the Selenium-Arsenic-Tellurium chalcogenide glass employed in the amorphous materials. SATICON is the fruits of co-operation of its able engineers and scientists in NHK and Hitachi, Ltd. since 1965.

In this catalog are shown concised technical data such as General data, Maximum ratings, Typical operation and Dimentional outline on all types of Hitachi SATICONs. More complete information is available on request to the sales representative at you place for Hitachi indicated back cover.

CONTENTS

FEATURES

1. SATICON target

The SATICON target consists of tin oxide, amorphous Se-As-Te chalogenide glass of about 4 microns in thickness evaporated in vacuum, and antimony-trisulfide. A heterojuction is formed between the tin oxide and the chalcogenide glass.

Selenium has a tendency to crystallize at room temperature and cause white spots. To avoid this problem, the selenium target is deped with arsenic of about 10%, to improve its reliability[2)]. Another problem in using selenium is its lack of red sensitivity. We had selected tellurium as the doping material to enhance the red sensitivity, and obtained a spectral response beyond 700 nanometers.

The SATICON target characteristcs deviation is extremely small, because manufacturing procedures are easily controlled, completely standardized and efficient.

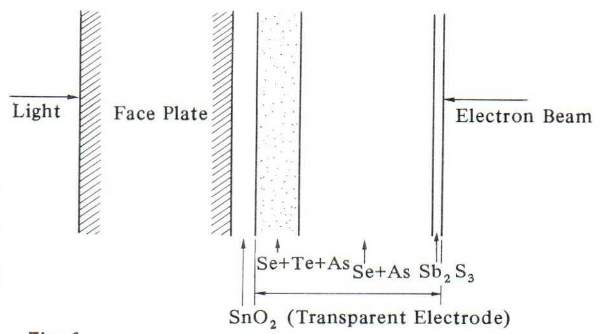

Fig. 1

Schematic representation of the SATICON target structure. The gradation in tellurium concentration is shown schematically by the distribution of the dots.

2. High resolution

Amplitude responce is 45% at 400 TV lines for H8397A. Resolution is almost independent of incident light wave length, and only is slightly affected by signal current and beam current.

3. Wide spectral response and high sensitivity

The well-balanced spectral sensitivity characteristic renders it ideally adaptable to color TV cameras. It has no sensitivity in the infrared region, and a high sensitivity for the blue light. No red, green and blue tube selection required.

Signal current for 2,000 lx scene illumination of 3,200°K obtains 160 nA, 200 nA and 100 nA for red, green and blue channels respectively for lens iris f:4 with using a suitable optical system.

4. Low lag

The lag is enough low for the practical operation with a bias light of equivalent 5 nA signal current.

Negligible flare

The flare phenomenon is not disturbing owing to the slight reflection coefficient of the photoconductor throughout the entire region of visible light; consequently, application of a flare tip and a flare compensation circuit is unnecessary.

5. Low dark current

Dark current, at a target voltage of 50 V, is 0.3 nA.

6. Gamma

The gamma value is about unity. Therefore a good contrast video picture is obtainable.

CHARACTERISTICS OF SATICON

1. Spectral response

As shown in Fig. 2, the spectral response of SATICON covers the entire visible light range and extends beyond 700 nanometers, and the response to red light is adequate for a color camera. Therefore it can be used for red, green and blue channels without selection. The SATICON Small-sized color camera's color reproduction is excellent because the of its wide spectral response. The signal to noise ratio of such cameras is more than 50 dB for a 0.2 μA signal current in the green channel (without gamma correction).

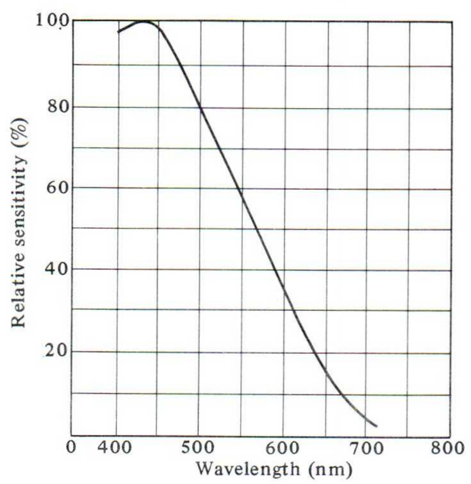

Fig. 2

2. Light transfer characteristics (example: H8397A)

The gamma value is 1 independent of incident light wave length.

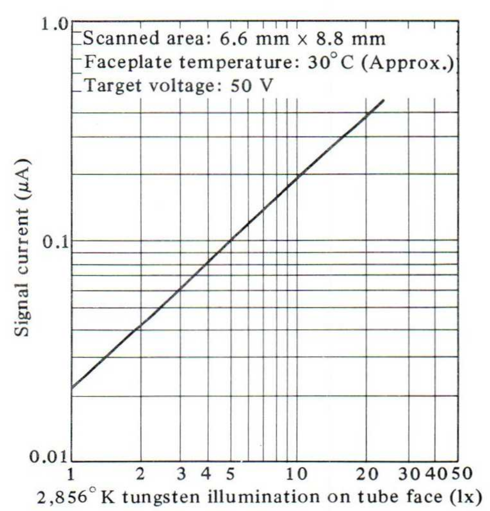

Fig. 3

3. Dark current vs Faceplate temperature characteristic (example: H8397A)

Fig. 4 shows the dark current vs temperature characteristics of SATICON. It shows that a faceplate temperature increment of 9°C doubles dark current. However, the dark current value is negligibly small, and the variation does not have an adverse affect on picture quality.

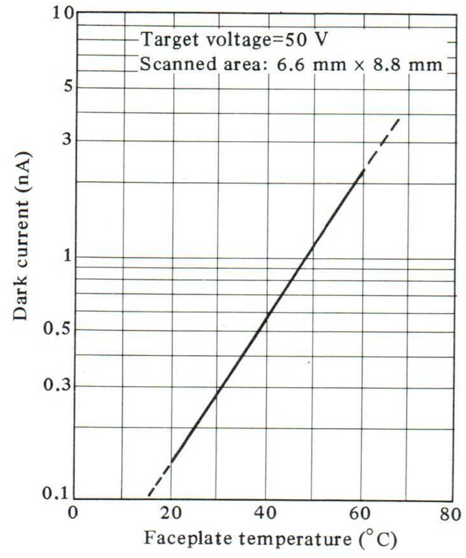

Fig. 4

4. Flare

As shown in Fig. 5, the spectral reflectivity of the SATICON target is smaller than that of other types of pickup tube. This reflected light is then reflected back from the front surface of the faceplate to the photoconductor. This unfavorable reflection of incident light causes spurious signals.

This harmful reflected light of SATICON is smaller than that of other conventional type camera tubes. It is not necessary to use a flare compensation circuit in SATICON color cameras in spite of the fact that there is no anti-halation glass tip in front of the faceplate.

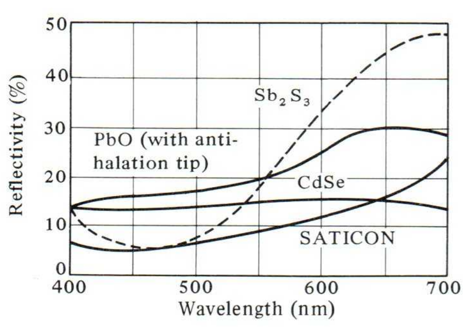

Fig. 5

Table 1 shows a reflectivity comparison between Saticon and the conventional Vidicon used in a telecine color camera. As is shown, SATICON's spurious signals caused by the flare are negligible.

Table 1.

Tube type	At the center of the picture	At the corners of the picture
SATICON	1	0.5
Vidicon	5	1

Note:

The value shown in the above table is defined as the percent ratio of the supurious signal current caused by the flare to a highlight signal current of 200 nA, using the uniform white pattern which is partially masked by a black square of 1/10 picture height on each side.

5. Sensitivity

Signal currents at 2,000 lx scene, illuminated by 3,200°K white light are as follows, for lens iris f:4 with an optical color separation system of FUJINON TVC-665 or TVC-555.

Red light . . . . 160 nA typical
Green light . . . . 200 nA typical
Blue light . . . . 100 nA typical

Figure 6 shows the transmission characteristics of newly developed FUJINON* TVC-665 color separation system suitable for the SATICON target.

*FUJI PHOTO OPTICAL CO., LTD.
No. 324 1-chome Uetake-machi,
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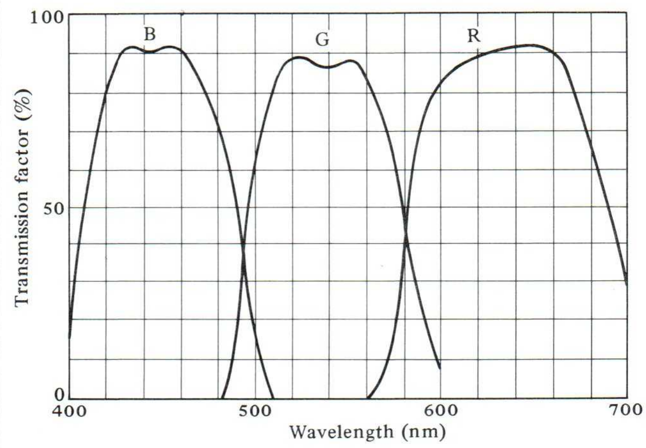


Fig. 6

6. Registration

The misregistration value of three channels in any set is never greater than 0.3% of the picture height at the corners of the picture, with adjustment of the centering position and picture size of each channel only.

7. Reliability (example: H8397A)

The life test results appear in Fig. 7. The deviation of beam current is only 5% of initial value at 5,000 hours with three times over beaming operation.

The SATICON is subjected to good quality controlled target production processes. As the result, the deviation of dark current and the appearance of spurious signals are not evident. This implies that target quality remains unchanged.

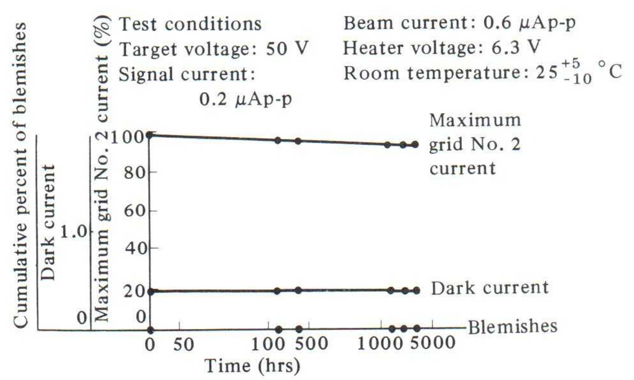


Fig. 7

YOKE ASSEMBLIES FOR SATICONs

It has the following features intended to realize minimum beam landing errors and proper registration.

1) Axial deviation of the center of the outer magnetic shielding cover of the Yoke assembly from the axis of the tube is less than 100 microns.

2) Inclination and deviation between the assembly axis and the tube axis are within 50 microns as a result of improving tube clamping structures.

3) Specially selected materials are used for focusing coil bobbins.

4) Yokes for vertical and horizontal deflection are precisely formed and assembled.

5) The shape of the magnetic shielding cover is designed to almost eliminate the effect of the terrestrial magnetic field.

6) The first stage of the preamplifier such as the FET and other circuit components can be mounted in the front end of the yoke assembly to eliminate stray capacity.

MAXIMUM RATINGS

The maximum ratings in the table are established in accordance with the following definition of the absolute maximum rating system for rating electron devices. Absolute maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data and should not be exceeded under the worst conditions.

The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations and the effects of changes in operating conditions due to variations in device characteristics.

The equipment manufacturer should design so that initially and throughout life no absolute maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect ot supply voltage variations, equipment component variation, equipment control adjustment, load variation, environmental conditions, and variations in device characteristics.

AUTOMATIC BEAM OPTIMIZER IC

Compact TV cameras are used as ENG (Electronic News Gathering). However, demand for an EFP (Electronic Field Production) camera with high picture quality equivalent to that of a studio camera has increased lately. Performance of the SATICON which has a high resolution and a low-lag was undertaken to satisfy this requirement. Hitachi recently improved the dynamic range of the camera to a great extent in order to obtain higher picture quality.

To improve the dynamic range, NHK (Japan Broadcasting Corporation), Hitachi Denshi, Ltd. and Hitachi, Ltd. developed the Automatic Beam Optimizer.

The Automatic Beam Optimizer consists of monolithic IC packages for application in all kinds of TV cameras.

The Automatic Beam Optimizer was designed to provide enough beam current for pickup tubes in order to discharge highlighted parts on the target and prevent insufficient beam current, comet tail and blooming which degrade the picture's quality, without affecting pickup tube's life or resolution.

This circuit controls beam current by means of an "Equivalent Return Beam Method" whereby the return beam parameter representing the beam current reserved is detected by the difference between signal output and beam current so that the beam current is always adequate.

When the Automatic Beam Optimizer is applied to a compact SATICON camera, the dynamic range increases to more than 4 lens-stops without detracting from the high resolution and good registration characteristics of SATICON.

When a camera is focused on objects that have a background highlight intensity such as windows enveloped in sunlight or fluorescent lights, good picture reproduction may be obstructed due to panning operations. In such cases, employing a camera, in conjunction with an Automatic Beam Optimizer will give the best quality picture. In an effort to achieve better reproduction, the range of EFP or ENG activities is being further extended.

The Automatic Beam Optimizer consists of three monolithic ICs (16-pin dual-in-line ceramic packages).

1. HA11252 (Pre-amplifier)
   High SN ratio and wide dynamic range pre-amplifier
2. HA11253 (Pre-processor)
   This IC compresses and clips the white peaks to obtain a clear picture without white detail deterioration.
   A conventional signal processing circuit can be used in conjunction with this IC package.
3. HA11254 (Beam Controller)
   The main part of the beam control circuit utilizes the "Equivalent Return Beam Method".

Note:

More complete technical data is available on request.

SATICON Tabulated data

■ SATICONs

Applications	Type No.	Typical applications	Features	Dimensions		
				Diameter (inches)	Overall length (mm)	Diameter (mm)
Broadcast	H8397A	For small sized, high quality color camera.	• Remarkable low lag • High resolution	2/3	105 max.	19.8 max.
	H8398	For small sized, high quality color camera.	• Remarkable low lag • With a glass button on F.P.	2/3	108.7 max.	19.8 max.
	H9336	Suitable for very small sized emergency use camera.	• Small size • Low lag • Short length type of H8397A	2/3	85 max.	19.8 max.
	H8362A	For high quality color film camera.	• Low lag • High resolution	1	162 max.	28.9 max.
	H9326	For studio or live camera.	• Low lag SATICON layer with a glass button on F.P.	1	167 max.	28.9 max.
CCTV · Medical · Industrial	H9311A	For industrial or CCTV use high quality color camera.	• Remarkable low lag	2/3	103 max.	19.8 max.
	H9313	For very small sized, low power consumption industrial or CCTV use color camera.	• Remarkable low lag • High resolution	2/3	103 max.	19.8 max.
	H9324	For high performance CCTV studio use color camera.	• Low lag • High resolution	1	162 max.	28.9 max.
	H9362	TV viewing of X-ray excited image screen.	• Low lag • High resolution	1	162 max.	28.9 max.
	H9353	High quality general use color TV camera.	• Integrated pick-up components with 3-tubes • Easy adjustment • Low power • Reliable and stable operation	2/3	115(L) x 107(H) x 42(W)	
	U1340	For small sized single tube color camera.	• Contains 2 sets of encoding filter.	2/3	107.5 max.	30

Notes:

♦ These characteristics are measured using the following optical filters: FC-HSR$_1$ (red), RC-HSG$_1$ (green), FC-HSB$_1$ (blue) with 2856°K illumination.

* These characteristics are obtained with using optical system of FUJINON TV-306B.

■ Yoke assemblies for SATICONs

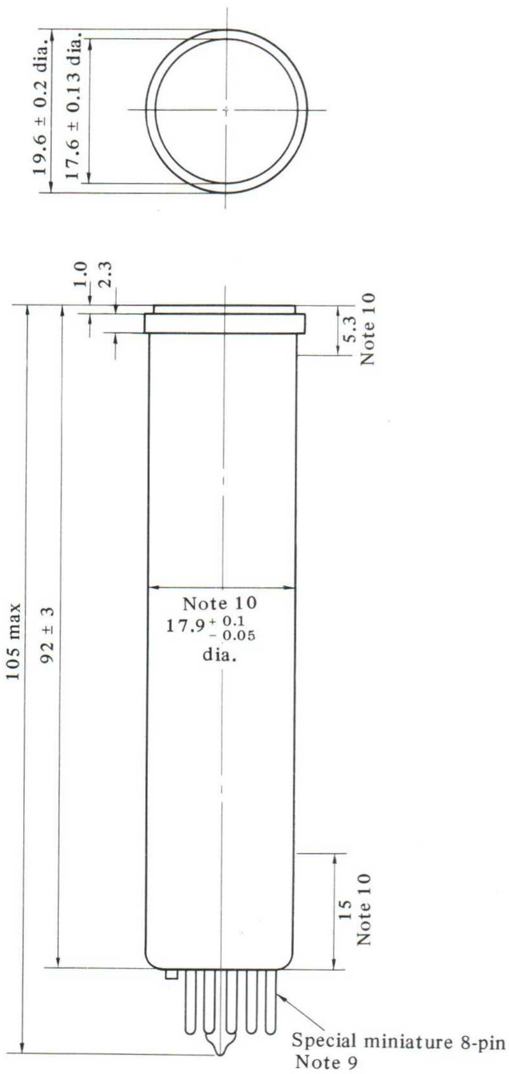
Type No.	For use with	Mechanical data			Focussing coil electrical data	
		Maximum outside diameter (mm)	Overall length (mm)	Weight approx. (g)	Current (mA)	Field strength (Gauss)
SY2001	H8397A	41.8	98.5	330	200	56
SY2002	H8397A	37	98	230	165	59
SY2003A	H8397A	36.4	98	230	165	59
SY2006	H9311A	38.3	93	120	145	56
SY2010	H9336	38	72	200	475	82.5
SY2052	H9313	30	88	60	–	–
SY2501	H8362A	68	150	1,200	100	68
SY2503	H9326	54.5	144	750	110	64

Method		Heater		Typical operation						Recommendable yoke assembly
Focusing	Deflection	Voltage (V)	Current (A)	Mesh voltage (V)	Amplitude response at 400 TV lines (%)	Lag at 3f (%)	Limiting resolution (TV lines)	Dark current (nA)	Signal output current (μA/1m)	
M	M	6.3	0.095	425	45	1.5	900	0.3		SY2001 SY2002 SY2003A
M	M	6.3	0.095	425	45	1.5	900	0.3		SY2001 SY2002 SY2003A
M	M	6.3	0.095	400	45	1.5	750	0.3		SY2010
M	M	6.3	0.095	900	60	2.5	1,100	0.6	◆ W: 350 R: 120 G: 150 B: 80	SY2501
M	M	6.3	0.095	900	60	2	1,100	0.6		SY2503
M	M	6.3	0.095	400	40	2	750	0.3		SY2006
E	M	6.3	0.095	500	35	2	750	0.3		SY2052
M	M	6.3	0.095	800	60	2	1,100	0.6		SY2504
M	M	6.3	0.095	900	65	3.5	1,200	0.6		SY2503
E	M	6.3	0.285	500 * *	20 * *	2 * *	500 * *	0.3 * *	R: 38 * G: 74 B: 87	With yoke assembly
E	M	6.3	0.095	1,000	–	3	–	0.3	–	With yoke assembly

† These characteristics are obtained with using bias light, for SATICON tubes.

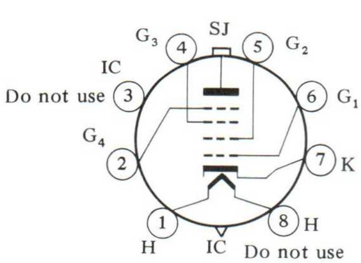
Resistance (Ω)	Deflection coil electrical data				Alignment coil (mA/Gauss)	Bias light source mounting	First stage of pre-amp. mounting
	Horizontal		Vertical				
	Inductance (mH)	Resistance (Ω)	Inductance (mH)	Resistance (Ω)			
23	1.18	3.8	20	150	32/4	NO	YES
24	1.3	5.5	20	130	30/4	NO	YES
24	1.3	5.5	20	130	30/4	YES	NO
37	0.85	4.2	32	142	Magnet max. 4 Gauss	YES	NO
4	1.3	5.5	5.5	32.5	20/4	NO	YES
–	0.8	5.0	10	100	Magnet max. 4 Gauss	YES	NO
130	1.4	2.5	60	171	35/4	YES	YES
110	1.6	3.8	20	65	30/4	YES	YES

Outline



Dimensions in mm

Base connection



Bottom view

■ FEATURES

- 2/3-inch diameter
- Magnetic focus, magnetic deflection
- Remarkable low lag characteristics
- High resolution

■ APPLICATION

- For high quality small sized color TV cameras and studio use in braodcast applications

■ GENERAL DATA

Heater voltage . . . . 6.3 V ± 10%
Heater current . . . . 0.095 A
Direct interelectrode capacitance:
  Target (signal electrode) to all other electrodes (Note 1) . . . . 3.5 pF
Optical:
  Maximum useful scanned area . . . . 6.6 mm x 8.8 mm
  Tube crientation . . . . Horizontal scan is essentially parallel to the plane passing through the tube axis and short pin.
  Thickness of faceplate . . . . 1.5 ± 0.2 mm
  Reflective index of faceplate 1.505
Focusing method . . . . Magnetic
Deflection method . . . . Magnetic
Overall length . . . . 105 mm max.
Greatest diameter . . . . 19.6 ± 0.2 mm
Operating position . . . . Any

■ MAXIMUM RATINGS

(Absolute maximum values, see page 5)

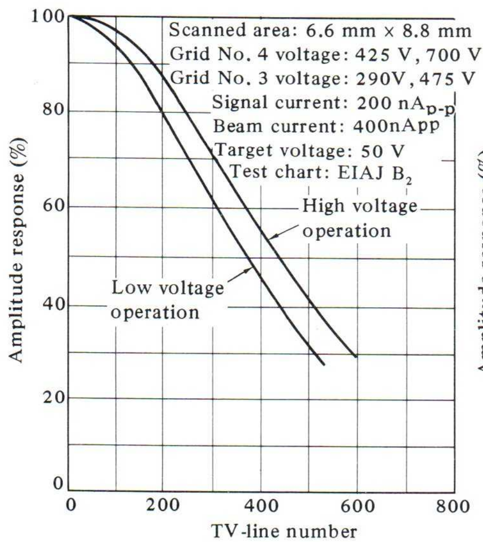
For scanned area of 6.6 mm x 8.8 mm
Grid No. 4 voltage . . . . 750 V
Grid No. 3 voltage . . . . 750 V
Grid No. 2 voltage . . . . 350 V
Grid No. 1 voltage:
  Negative bias value . . . . 300 V
  Positive bias value . . . . 0 V
Peak heater-cathode voltage:
  Heater negative with respect ot cathode . . . . 125 V
  Heater positive with respect to cathode . . . . 60 V
Target voltage . . . . 80 V
Faceplate:
  Illumination . . . . 500 lx
  Temperature . . . . 50°C

■ TYPICAL OPERATION (Note 2)

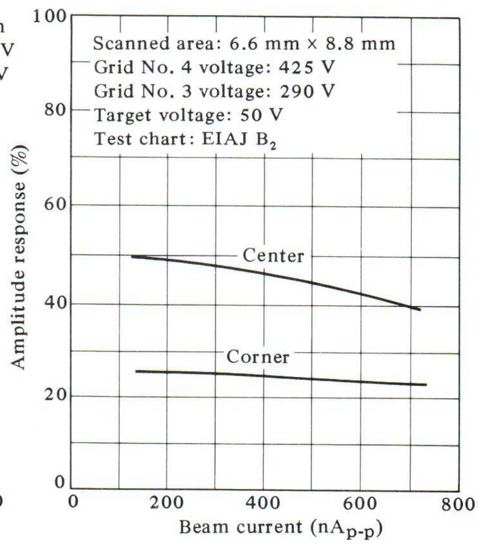
For scanned area of 6.6 mm x 8.8 mm
Faceplate temperature . . . . 25 ~ 35°C

	Low voltage operation	High voltage operation
Grid No. 4 voltage (Note 3)	425	700 V
Grid No. 3 voltage (Note 3)	290	475 V
Grid No. 2 voltage	300	300 V

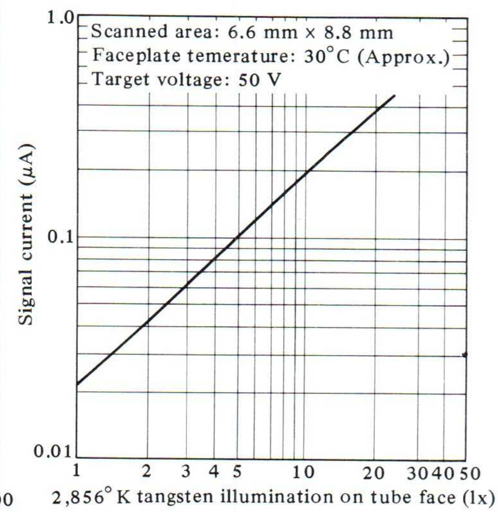
■ **Amplitude response**



■ **Relative response–beam current characteristics**



■ **Light transfer characteristic**



Grid No. 1 voltage for picture cutoff
(Note 4) . . . . –80 ~ –130 V

Miminum peak to peak blanking voltage:
when applied to grid No. 1 . . . . 75 Vp-p
when applied to cathode . . . . 20 Vp-p

Field strength at center of focusing coil . . . 59 76 G

Target voltage (Note 5) . . . . 50 V

Dark current . . . . 0.3 nA

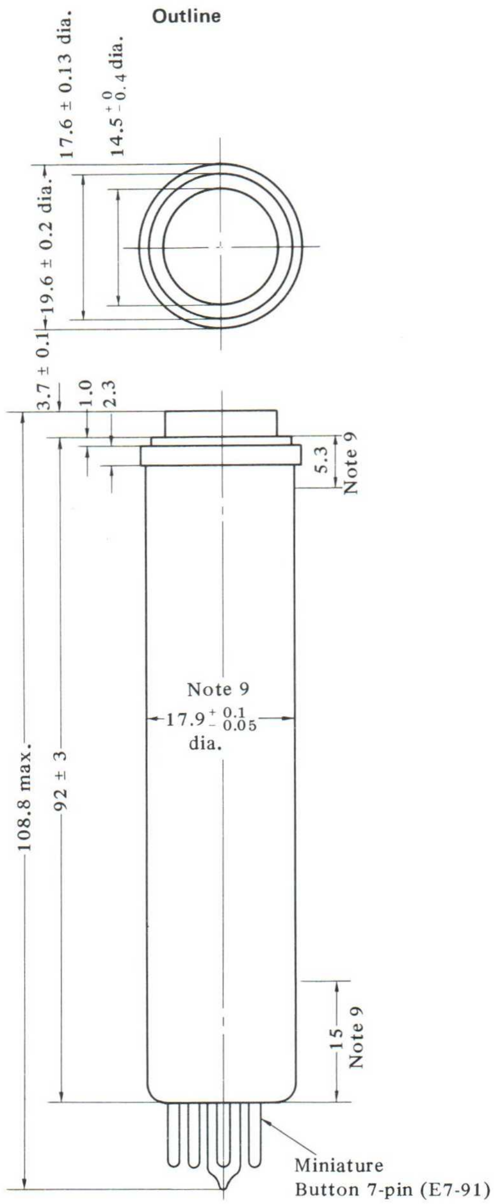
Sensitivity (2,856 K tungsten illumination on tube face)
(Note 6, Note 7) . . . . W 350 μA/1 m
R 120 μA/1m, G 150 μA/1m, B 80 μA/1 m

Gamma (Approx.) 1

Lag (Note 8) 1.5%
(With applying bias light equivalent 5 nA signal current.)

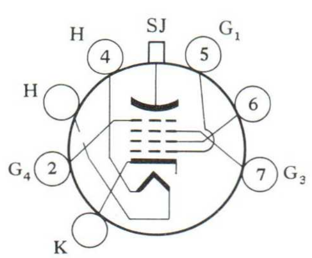
1. This value is an effective output impedance, which increases when a tube is inserted in the yoke assembly.
2. For Yoke assembly, use a Hitachi SATICON yoke assembly SY2003A or its equivalent.
3. Grid No. 4 voltage must always be greater than Grid No. 3 voltage. The optimum ratio of Grid No. 3 to Grid No. 4 voltage depends on the yoke assembly used. This ratio should be adjusted for optimum performance with regard to signal uniformity and geometrical accuracy.
   This value was actually measured with a HITACHI YOKE ASSEMBLY SY2003A or its equivalent. In this case, the recommended ratio of Grid No. 3 to Grid No. 4 voltage is 0.68.
4. Adjust the Grid No. 1 voltage so that beam current reaches the rated value.
5. Set the target voltage precisely at 50 V. Lower voltage will cause deterioration of photoconductor performance, and higher voltage will reduce the service life. The target voltage and current characteristic represent their saturation characteristics.
   Accordingly, automatic sensitivity adjustment by varying the target voltage is impossible.
6. The sensitivity is a value obtained by measuring a signal current for faceplate illumination of 10 lx by employing a light source at 2,856 K color temperature and dividing the signal current by incident light flux.
   In the case of color sensitivity, the filters listed below are employed respectively, and the color sensitivity expressed in terms of μA/1 m of white light before the filter.
   R : FC-HS R1 filter
   G : FC-HS G1 filter
   B : FC-HS B1 filter
7. Spectral transmission factors of the filters are shown in Fig. 6. FC-HS filters are designed of which transmission factor resemble to that of FUJINON TVC-665 or TVC-555 series optical system.
   FUJI PHOTO OPTICAL CO., LTD.
   No. 324 1-chome Uetake-machi,
   Omiya, Saitama Pref.
   JAPAN
8. The lag is the percent of initial value of signal output current 1/20 seconds after illumination is removed, when the signal current is set at 0.2 μAp-p and the beam current at 0.4 μAp-p.
9. Socket for this tube is S8-504B-90 made by CHUO MUSEN CO., Ltd., 1-Chome, Ohmori-Nishi, Ohta-ku, Tokyo, JAPAN.
10. The outside diameter value $17.9\pm^{0.1}_{0.05}$ dia./ mm shall not apply to the target-side 5.3 mm and the stem-side 15 mm section. The value for the stem-side 15 mm section shall be 18.0 dia./mm max.

Outline



Dimensions in mm

Base connection



Bottom view

■ FEATURES

- 2/3-inch diameter
- Magnetic focus, magnetic deflection
- Remarkable low lag characteristic
- High resolution
- With a glass buttom on F.P.

■ APPLICATION

- For high quality small sized color TV cameras and studio use in broadcast applications

■ GENERAL DATA

Heater voltage . . . . 6.3 V ± 10%
Heater current . . . . 0.095 A
Direct interelectrode capacitance:
  Target (signal electrode) to all other electrodes (Note 1) . . . . 3.5 pF
Optical:
  Maximum useful scanned area . . . . 6.6 mm x 8.8 mm
  Tube orientation . . . . Horizontal scan is essentially parallel to the plane passing through the tube axis and No. 4 pin.
  Thickness of faceplate . . . . 1.5 ± 0.2 mm
  Reflective index of faceplate 1.505
Focusing method . . . . Magnetic
Deflection method . . . . Magnetic
Overall length . . . . 108.8 mm max.
Greatest diameter . . . . 19.6 ± 0.2 mm
Operating position . . . . Any

■ MAXIMUM RATINGS

(Absolute maximum values, see page 5)

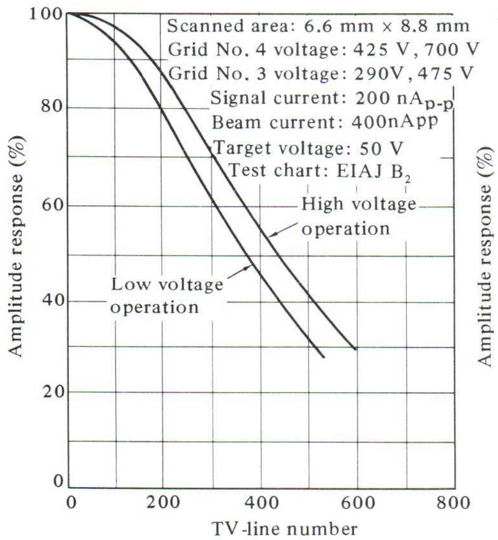
For scanned area of 6.6 mm x 8.8 mm
Grid No. 4 voltage . . . . 750 V
Grid No. 3 voltage . . . . 750 V
Grid No. 2 voltage . . . . 350 V
Grid No. 1 voltage:
  Negative bias value . . . . 300 V
  Positive bias value . . . . 0 V
Peak heater-cathode voltage:
  Heater negative with respect to cathode . . . . 125 V
  Heater positive with respect to cathode . . . . 60 V
Target voltage . . . . 80 V
Faceplate:
  Illumination . . . . 500 lx
  Temperature . . . . 50°C

■ TYPICAL OPERATION (Note 2)

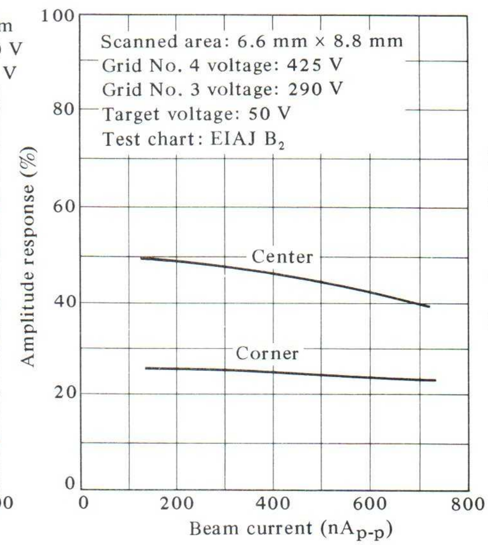
For scanned area of 6.6 mm x 8.8 mm
Faceplate temperature . . . . 25 ~ 35°C

	Low voltage operation	High voltage operation
Grid No. 4 voltage (Note 3)	425	700 V
Grid No. 3 voltage (Note 3)	290	475 V
Grid No. 2 voltage		300 V
Grid No. 1 voltage for picture cutoff (Note 4)		−40 ~ −100 V

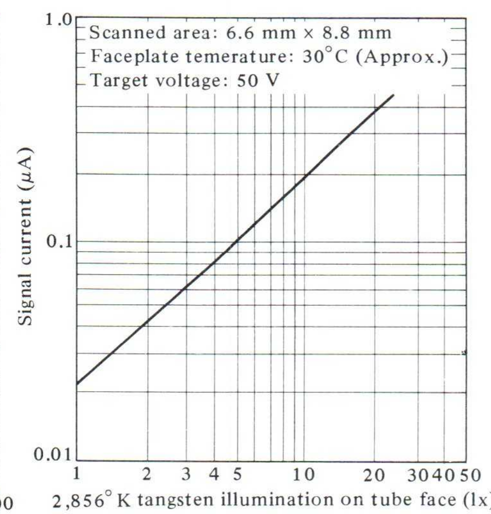
■ **Amplitude response**



■ **Relative response—beam current characteristics**



■ **Light transfer characteristic**

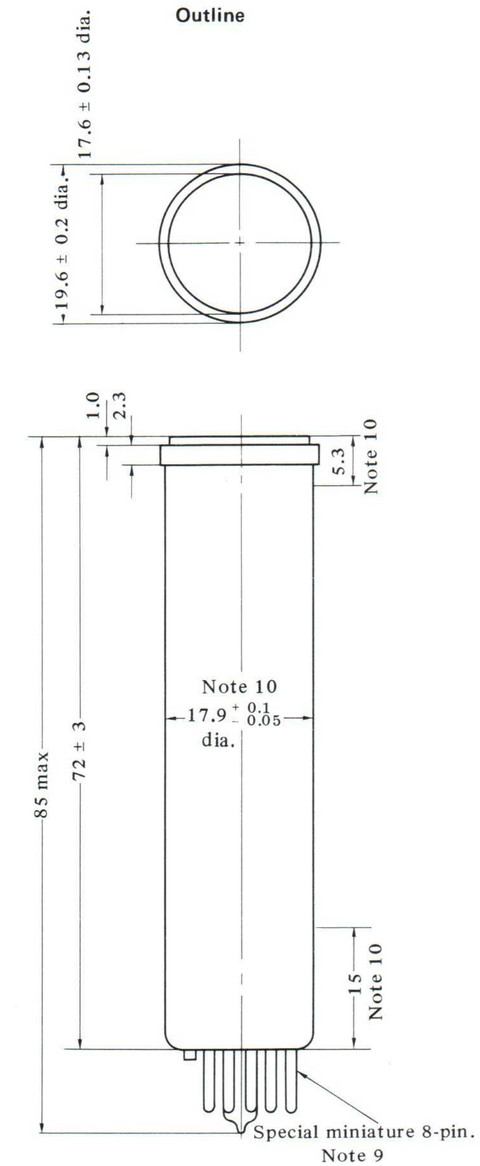


Minimum peak to peak blanking voltage:
- when applied to grid No. 1 . . . . 75 Vp-p
- when applied to cathode . . . . 20 Vp-p

Field strength at center of focusing coil . . . 55 70 G
Target voltage (Note 5) . . . . 50 V
Dark current . . . . 0.3 nA
Sensitivity (2,857 K tungsten illumination on tube face)
(Note 6, Note 7) . . . . W 350 μA/1 m
R 120 μA/1 m, G 150 μA/1 m, B 80 μA/1 m
Gamma (Approx.) 1
Lag (Note 8) 1.5%
(With applying bias light equivalent 5 nA signal current.)

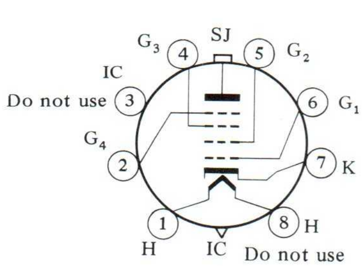
1. This value is an effective output impedance, which increases when a tube is inserted in the yoke assembly.
2. For Yoke assembly, use a Hitachi SATICON yoke assembly ST2003A or its equivalent.
3. Grid No. 4 voltage must always be greater than Grid No. 3 voltage. The optimum ratio of Grid No. 3 to Grid No. 4 voltage depends on the yoke assembly used. This ratio should be adjusted for optimum performance with regard to signal uniformity and geometrical accuracy.
   This value was actually measured with a HITACHI YOKE ASSEMBLY ST2003A or its equivalent. In this case, the recommended ratio of Grid No. 3 to Grid No. 4 voltage is 0.68.
4. Adjust the Grid No 1 voltage so that beam current reaches the rated value.
5. Set the target voltage precisely at 50 V. Lower voltage will cause deterioration of photoconductor performance, and higher voltage will reduce the service life. The target voltage and current characteristic represent their saturation characteristics.
   Accordingly, automatic sensitivity adjustment by varying The target voltage is impossible.
6. The sensitivity is a value obtained by measuring a signal current for faceplate illumination of 10 lx by employing a light source at 2,856 K color temperature and dividing the signal current by incident light flux.
   In the case of color sensitivity, the filters listed below are employed respectively, and the color sensitivity expressed in terms of μA/1 m of white light before the filter.
   R : FC-HS R1 filter
   G : FC-HS G1 filter
   B : FC-HS B1 filter
7. Spectral transmission factors of the filters are shown in Fig. 6. FC-HS filters are designed of which transmission factor resemble to that of FUJINON TVC-665 or TVC-555 series optical system.
   FUJI PHOTO OPTICAL CO., LTD.
   No. 324 1-chome Uetake-machi,
   Omiya, Saitama Pref.
   JAPAN
8. The lag is the percent of initial value of signal output current 1/20 seconds after illumination is removed, when the signal current is set at 0.2 μAp-p and the beam current at 0.4 μAp-p.
9. The outside diameter value $17.9 \pm ^{0.1}_{0.05}$ dia./mm shall not apply to the target-side 5.3 mm and the stem-side 15 mm section. The value for the stem-side 15 mm section shall be 18.0 dia./mm max..

Outline



Dimensions in mm

Base connection



Bottom view

■ FEATURES

- 2/3-inch diameter
- Magnetic focus, magnetic deflection
- Small size
- Remarkably low lag

■ APPLICATION

- Suitable for very small sized emergency use camera

■ GENERAL DATA

Heater voltage . . . . 6.3 V ± 10%
Heater current . . . . 0.095 A
Direct interelectrode capacitance:
  Target (signal electrode) to all other
  electrodes (Note 1) . . . . 3.5 pF
Optical:
  Maximum useful scanned area . . . . 6.6 mm x 8.8 mm
  Tube orientation . . . . Horizontal scan is essentially parallel to the plane passing through the tube axis and short pin.
  Thickness of faceplate . . . . 1.5 ± 0.2 mm
  Reflective index of faceplate 1.505
Focusing method . . . . Magnetic
Deflection method . . . . Magnetic
Overall length . . . . 85 mm max.
Greatest diameter . . . . 19.6 ± 0.2 mm
Operating position . . . . Any

■ MAXIMUM RATINGS

(Absolute maximum values, see page 5)

For scanned area of 6.6 mm x 8.8 mm

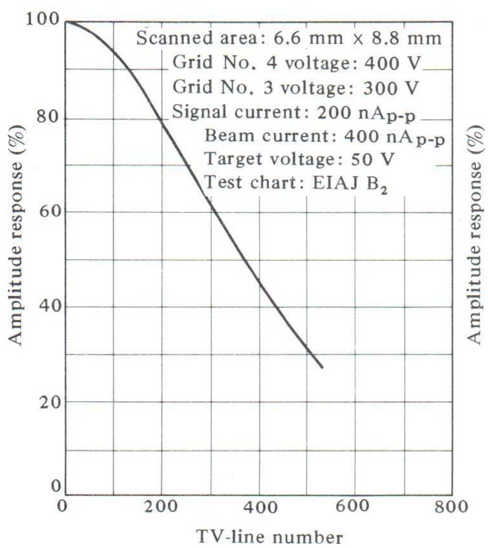
Grid No. 4 voltage . . . . 750 V
Grid No. 3 voltage . . . . 750 V
Grid No. 2 voltage . . . . 350 V
Grid No. 1 voltage:
  Negative bias value . . . . 300 V
  Positive bias value . . . . 0 V
Peak heater-cathode voltage:
  Heater negative with respect to cathode . . . . 125 V
  Heater positive with respect to cathode . . . . 60 V
Target voltage . . . . 80 V
Faceplate:
  Illumination . . . . 500 lx
  Temperature . . . . 50°C

■ TYPICAL OPERATION (Note 2)

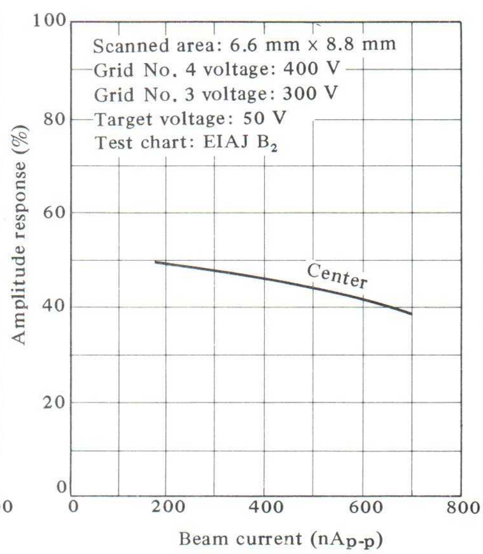
For scanned area of 6.6 mm x 8.8 mm

Faceplate temperature . . . . 25 ~ 35°C
Grid No. 4 valtage (Note 3) . . . . 400 V
Grid No. 3 voltage (Note 3) . . . . 300 V
Grid No. 2 voltage . . . . 300 V
Grid No. 1 voltage for picture cutoff (Note 4) −40 ~ −100 V
Minimum peak to peak blanking voltage:
  when applied to grid No. 1 . . . . 75 Vp-p
  when applied to cathode . . . . 20 Vp-p

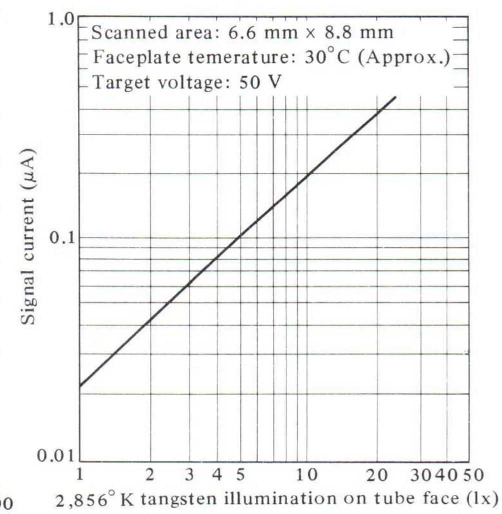
■ **Amplitude response**



■ **Relative response—beam current characteristics**



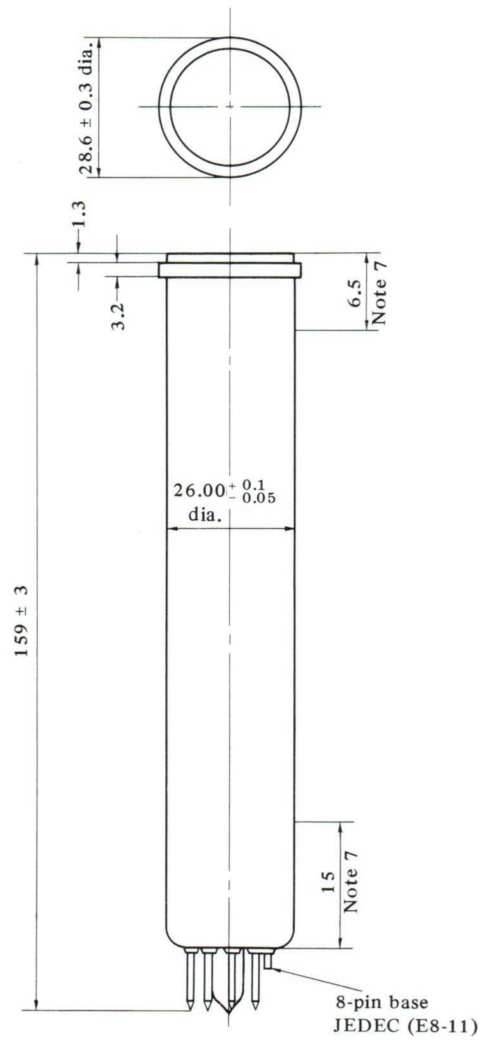
■ **Light transfer characteristic**



Field strength at center of focusing coil . . . . 82.5 G
Target voltage (Note 5) . . . . 50 V
Dark current . . . . 0.3 nA
Sensitivity (2,856° K tungsten illumination on tube face)
(Note 6, Note 7) . . . . W 350 μA/1 m
R 120 μA/1 m, G 150 μA/1 m, B 80 μA/1 m
Gamma (Approx.) 1
Lag (Note 8) 1.5%
(With applying bias equivalent 5 nA signal current.)

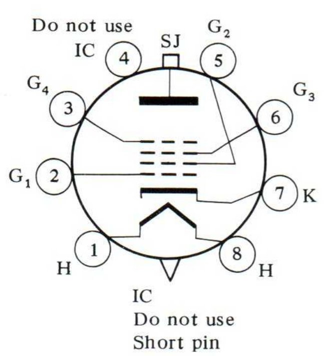
1. This value is an effective output impedance, which increases when a tube is inserted in the yoke assembly.
2. For Yoke assembly, use a Hitachi SATICON yoke assembly SY2010 or its equivalent.
3. Grid No. 4 voltage must always be greater than Grid No. 3 voltage. The optimum ratio of Grid No. 3 to Grid No. 4 voltage depends on the yoke assembly used. This ratio should be adjusted for optimum performance with regard to signal uniformity and geometrical accuracy.
   This value was actually measured with a HITACHI YOKE ASSEMBLY SY2010 or its equivalent. In this case, the recommended ratio of Grid No. 3 to Grid No. 4 voltage is 0.75.
4. Adjust the grid No. 1 voltage so that beam current reaches the rated value.
5. Set the target voltage precisely at 50 V. Lower voltage will cause deterioration of photoconductor performance, and higher voltage will reduce the service life. The target voltage and current characteristic represent their saturation characteristics.
   Accordingly, automatic sensitivity adjustment by varying the target voltage is impossible.
6. The sensitivity is a value obtained by measuring a signal current for faceplate illumination of 10 lx by employing a light souce at 2,856° K color temperature and dividing the signal current by incident light flux.
   In the case of color sensitivity, the filters listed below are employed respectively, and the color sensitivity expressed in terms of μA/1 m of white light before the filter.
   R : FC-HS R1 filter
   G : FC-HS G1 filter
   B : FC-HS B1 filter
7. Spectral transmission factors of the filters are shown in Fig. 6. FC-HS filters are designed of which transmission factor resemble to that of FUJINON TVC-665 or TVC-555 series optical system.
   FUJI PHOTO OPTICAL CO., LTD.
   No. 324 1-chome Uetake-machi,
   Omiya, Saitama Pref.
   JAPAN
8. The lag is the percent of initial value of signal output current 1/20 seconds after illumination is removed, when the signal current is set at 0.2 μAp-p and the beam current at 0.4 μAp-p.
9. Socket for this tube is S8-504B-90 made by CHUO MUSEN CO., LTD., 1-Chome, Ohmori-Nishi, Ohta-ku, Tokyo, JAPAN.
10. The outside diameter value 17.9 $\pm^{0.1}_{0.05}$ dia./mm shall not apply to the target-side 5.3 mm and the stem-side 15 mm section. The value for the stem-side 15 mm section shall be 18.0 dia./mm max..

Outline



Dimensions in mm

Base connection



Bottom view

■ FEATURES

- 1-inch diameter
- Magnetic focus, magnetic deflection
- Low lag
- High resolution

■ APPLICATION

- For telecine color TV cameras in broadcast applications

■ GENERAL DATA

Heater voltage	6.3 V ± 10%
Heater current	0.095 A
Direct interelectrode capacitance:	
Target (signal electrode) to all other electrodes (Note 1)	4.6 pF
Optical:	
Maximum useful scanned area	9.5 mm x 12.7 mm
Tube orientation	Horizontal scan is essentially parallel to the plane passing through the tube axis and short pin.
Thickness of faceplate	2.39 ± 0.2 mm
Reflective index of faceplate	1.505
Focusing method	Magnetic
Deflection method	Magnetic
Overall length	159 ± 3 mm
Greatest diameter	28.6 ± 0.3 mm
Operating position	Any

■ MAXIMUM RATINGS

(Absolute maximum values, see page 5)

For scanned area of 9.5 mm x 12.7 mm

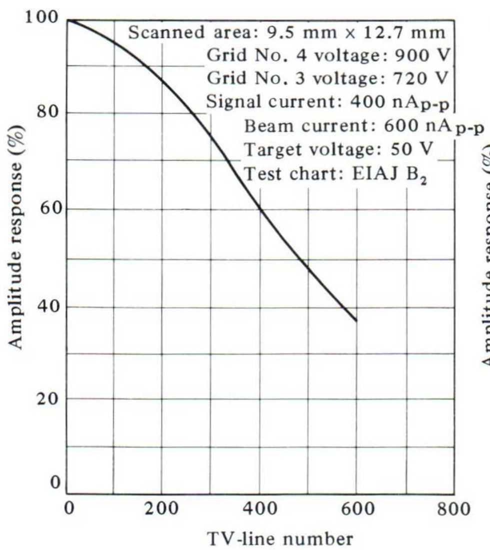
Grid No. 4 voltage	1,500 V
Grid No. 3 voltage	1,000 V
Grid No. 2 voltage	750 V
Grid No. 1 voltage:	
Negative bias value	300 V
Positive bias value	0 V
Peak heater-cathode voltage:	
Heater negative with respect to cathode	125 V
Heater positive with respect to cathode	60 V
Target voltage	80 V
Faceplate:	
Illumination	500 lx
Temperature	50°C

■ TYPICAL OPERATION (Note 2)

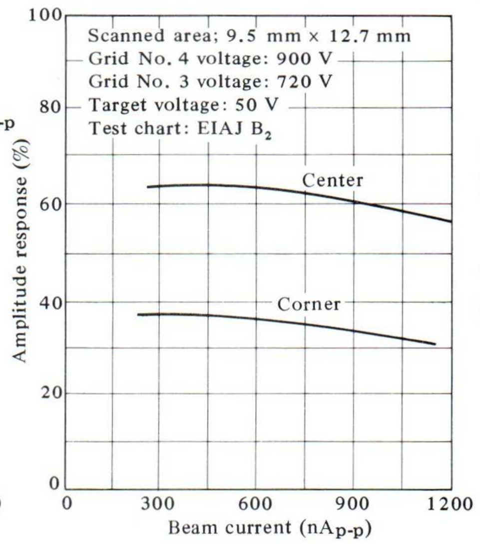
For scanned area of 9.5 mm x 12.7 mm

Faceplate temperature	25 ~ 35°C
Grid No. 4 voltage (Note 3)	400 V
Grid No. 3 voltage (Note 3)	300 V
Grid No. 2 voltage	300 V
Grid No. 1 voltage for picture cutoff (Note 4)	–40 ~ –100 V
Minimum peak to peak blanking voltage:	
when applied to grid No. 1	75 Vp-p
when applied to cathode	20 Vp-p

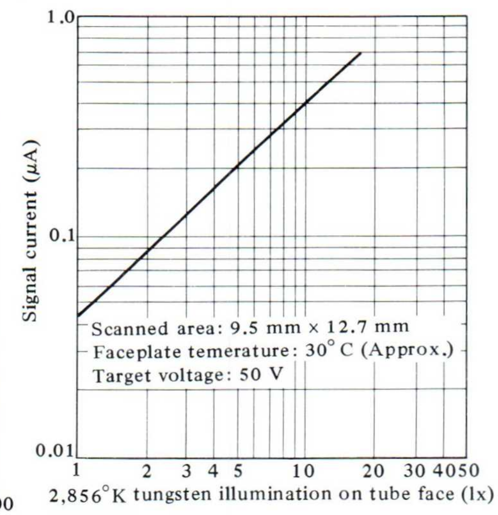
■ **Amplitude response**



■ **Relative response—beam current characteristics**



■ **Light transfer characteristic**

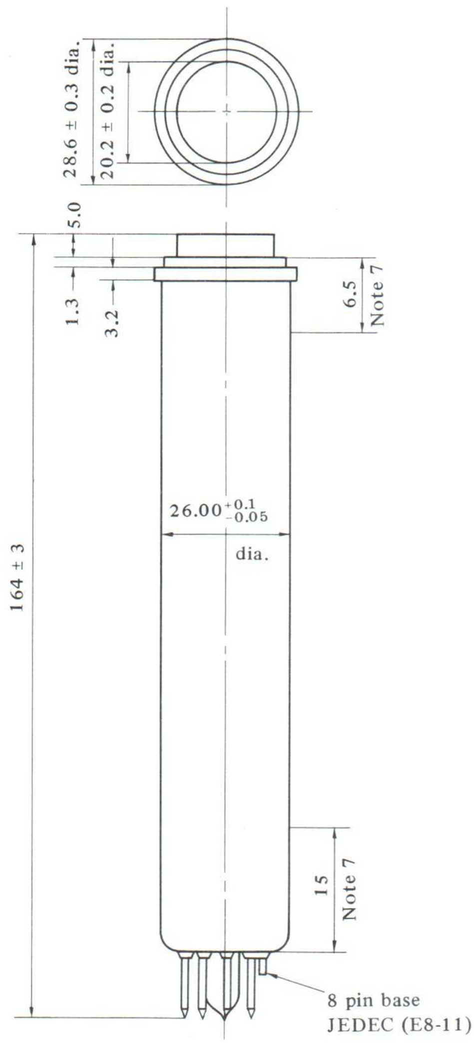


Field strength at center of focusing coil . . . . 68 G
Target voltage (Note 5) . . . . 50 V
Dark current . . . . 0.3 nA
Sensitivity (2,856° K tungsten illumination on tube face)
(Note 6, Note 7) . . . . W 350 μA/1 m
R 120 μA/1 m, G 150 μA/1 m, B 80 μA/1 m
Gamma (Approx.) 1
Lag (Note 8) 2.5%
(With applying bias light equivalent 5 nA signal current.)

Note:

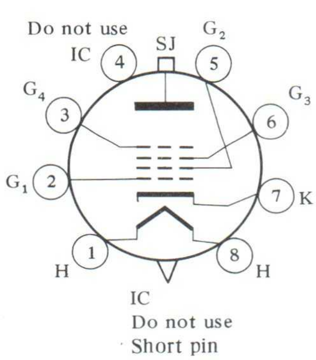
1. This value is an effective output impedance, which increases when a tube is inserted in the yoke assembly.
2. For yoke assembly, use a Hitachi SATICON yoke assembly SY2501 or its equivalent.
3. Set the target voltage precisely at 50 V. Lower voltage will cause deterioration of photoconductor performance, and higher voltage will reduce the service life. The target voltage and current characteristic represent their saturation characteristics. Accordingly, automatic sensitivity adjustment by varying the target voltage is impossible.
4. The sensitivity is a value obtained by measuring a signal current for faceplate illumination of 10 lx by employing a light source at 2,856° K color temperature and dividing the signal current by incident light flux.
In the case of color sensitivity, the filters listed below are employed respectively, and the color sensitivity expressed in terms of μA/1 m of white light before the filter.
R : FC-HS R1 filter
G : FC-HS G1 filter
B : FC-HS B1 filter
5. Spectral transmission factors of the filters are shown in Fig. 6. FC-HS filters are designed of which transmission factor resemble to that of FUJINON TVC-665 or TVC-555 series optical system.
FUJI PHOTO OPTICAL CO., LTD.
No. 324 1-chome Uetake-machi,
Omiya, Saitama Pref.
JAPAN
6. The lag is the percent of initial value of signal output current 1/20 seconds after illumination is removed, when the signal current is set at 0.4 μAp-p, and the beam current at 0.6 μAp-p.
7. The outside diameter value $26.00 \pm ^{0.1}_{0.05}$ dia./mm shall not apply to the target-side 6.5 mm and the stem-side 15 mm section. The value for the stem-side 15 mm section shall be 26.1 dia./mm max.. Regarding the target side, refer to Note 2 below.

Outline



Dimensions in mm

Base connection



Bottom view

■ FEATURES

- 1-inch diameter
- Magnetic focus, magentic deflection
- Remarkably low lag SATICON layer
- With a glass by button on F.P.

■ APPLICATION

- For studio or live camera

■ GENERAL DATA

Heater voltage	6.3 ± 10%
Heater current	0.095 A
Direct interelectrode capacitance:	
Target (signal electrode) to all other electrodes (Note 1)	4.6 pF
Optical:	
Maximum useful scanned area	9.5 mm x 12.7 mm
Tube orientation	Horizontal scan is essentially parallel to the plane passing through the tube axis and short pin.
Thickness of faceplate	2.39 ± 0.2 mm
Reflective index of faceplate	1.505
Focusing method	Magnetic
Deflection method	Magnetic
Overall length	167 mm max.
Greatest diameter	28.6 ± 0.3 mm
Operating position	Any

■ MAXIMUM RATINGS

(Absolute maximum values, see page 5)

For scanned area of 9.5 mm x 12.7 mm

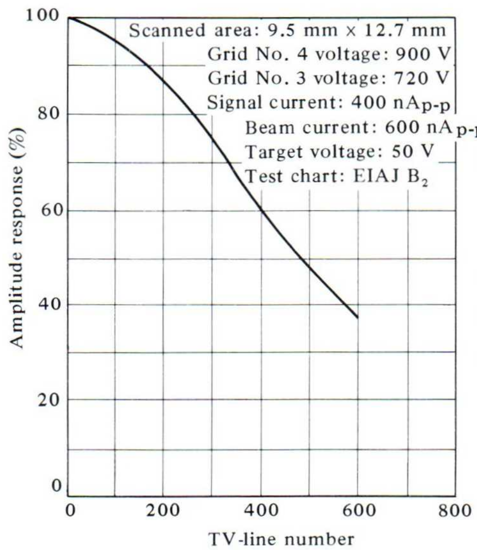
Grid No. 4 voltage	1,500 V
Grid No. 3 voltage	1,000 V
Grid No. 2 voltage	750 V
Grid No. 1 voltage:	
Negative bias value	300 V
Positive bias value	0 V
Peak heater-cathode voltage:	
Heater negative with respect to cathode	125 V
Heater positive with respect to cathode	80 V
Target voltage	80 V
Faceplate:	
Illumination	500 lx
Temperature	50°C

■ TYPICAL OPERATION (Note 2)

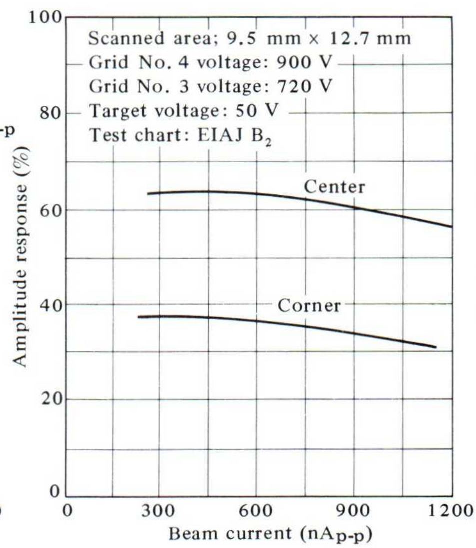
For scanned area of 9.5 mm x 12.7 mm

Faceplate temperature	25 ~ 35°C
Grid No. 4 voltage	900 V
Grid No. 3 voltage	630 V
Grid No. 2 voltage	300 V
Grid No. 1 voltage for picture cutoff	−40 ~ −100 V
Minimum peak to peak blanking voltage:	
when applied to grid No. 1	75 Vp-p
when applied to cathode	20 Vp-p

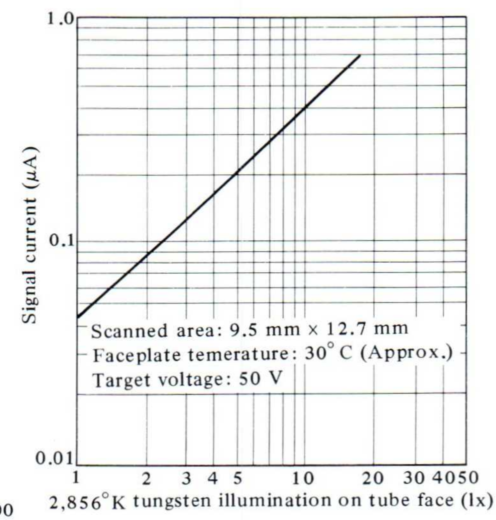
■ Amplitude response



■ Relative response—beam current characteristics



■ Light transfer characteristic



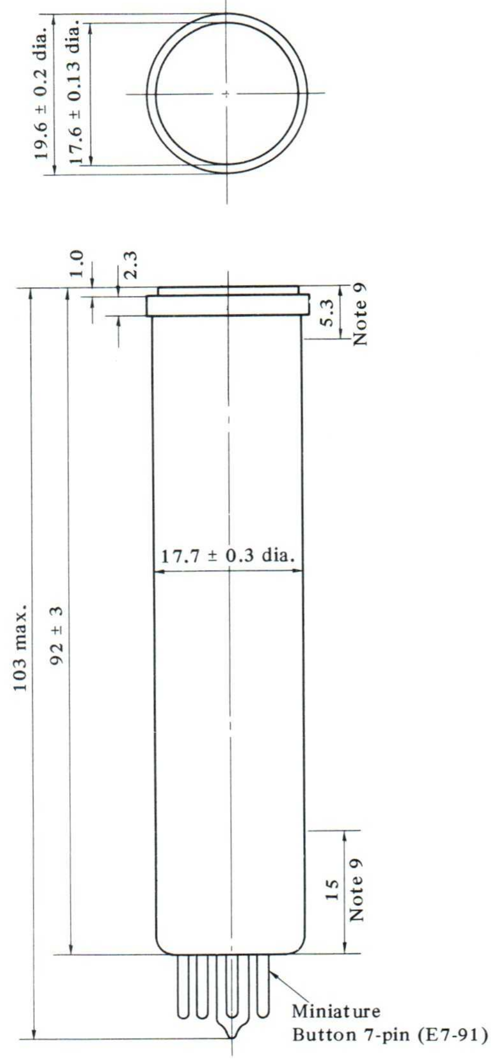
Field strength at center of focusing coil . . . . 68 G
Target voltage (Note 3) . . . . 65 V
Dark current . . . . 0.3 nA
Sensitivity (2,856°K tungsten illumination on tube face)
(Note 4, Note 5) . . . . W 350 μA/1 m
R 120 μA/1 m, G 150 μA/1 m, B 80 μA/1 m
Gamma (Approx.) 1
Lag (Note 6) 1.5%
(With applying bias light equivalent 10 nA signal current.)

Note:

1. This value is an effective output impedance, which increases when a tube is inserted in the yoke assembly.
2. For yoke assembly, use a Hitachi SATICON yoke assembly SY2503 or its equivalent.
3. Set the target voltage precisely at 65 V. Lower voltage will cause deterioration of photoconductor performance, and higher voltage will reduce the service life. The target voltage and current characteristic represent their saturation characteristics. Accordingly, automatic sensitivity adjustment by varying the target voltage is impossible.
4. The sensitivity is a value obtained by measuring a signal current for faceplate illumination of 10 lx by employing a light source at 2,856°K color temperature and dividing the signal current by incident light flux.
   In the case of color sensitivity, the filters listed below are employed respectively, and the color sensitivity expressed in terms of μA/1 m of white light before the filter.
   R : FC-HS R1 filter
   G : FC-HS G1 filter
   B : FC-HS B1 filter
5. Spectral transmission factors of the filters are shown in Fig. 6. FC-HS filters are designed of which transmission factor resemble to that of FUJINON TVC-665 or TVC-555 series optical system.
   FUJI PHOTO OPTICAL CO., LTD.
   No. 324 1-chome Uetake-machi,
   Omiya, Saitama Pref.
   JAPAN
6. The lag is the percent of initial value of signal output current 1/20 seconds after illumination is removed, when the signal current is set at 0.4 μAp-p, and the beam current at 0.6 μAp-p.
7. The outside diameter value $26.00\pm^{0.1}_{0.05}$ dia./mm shall not apply to the target-side 6.5 mm and the stem-side 15 mm section. The value for the stem-side 15 mm section shall be 26.1 dia./mm max.. Regarding the target side, refer to Note 2 below.

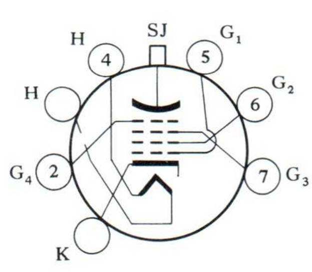
HITACHI SATICON H9311A

Outline



Dimensions in mm

Base connection



Bottom view

■ FEATURES

- 2/3-inch diameter
- Magnetic focus, magnetic deflection
- Remarkable low lag characteristic

■ APPLICATION

- For hand-held color TV cameras in educational, medical and high quality industrial applications

■ GENERAL DATA

Heater voltage . . . . 6.3 V ± 10%
Heater current . . . . 0.095 A
Direct interelectrode capacitance:
Target (signal electrode) to all other electrodes (Note 1) . . . . 3.5 pF
Optical:
Maximum useful scanned area . . . . 6.6 mm x 8.8 mm
Tube orientation . . . . Horizontal scan is essentially parallel to the plane passing through the tube axis and No. 4 pin.
Thickness of faceplate . . . . 1.5 ± 0.2 mm
Reflective index of faceplate 1.505
Focusing method . . . . Magnetic
Deflection method . . . . Magneitc
Overall length . . . . 103 mm max.
Greatest diameter . . . . 19.6 ± 0.2 mm
Operating position . . . . Any

■ TYPICAL OPERATION (Note 2)

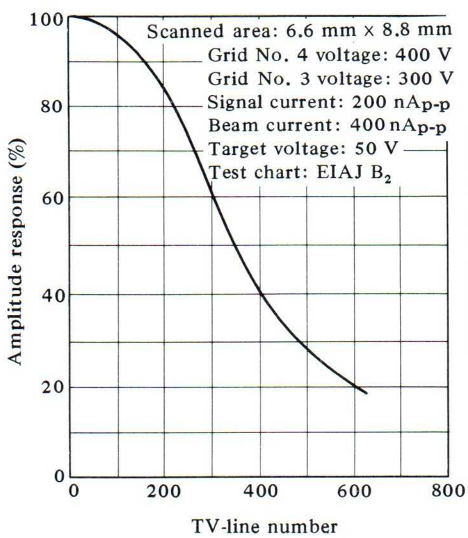
For sanned area of 6.6 mm x 8.8 mm
Faceplate temperature . . . . 25 ~ 35°C
Grid No. 4 voltage (Note 3) . . . . 400 V
Grid No. 3 voltage (Note 3) . . . . 300 V
Grid No. 2 voltage . . . . 300 V
Grid No. 1 voltage for picture cutoff
(Note 4) . . . . −40 ~ −100 V
Minimum peak to peak blanking voltage:
when applied to grid No. 1 . . . . 75 Vp-p
when applied to cathode . . . . 20 Vp-p

■ MAXIMUM RATINGS

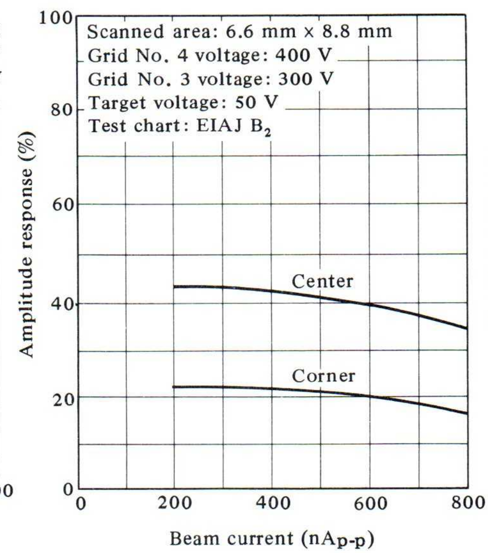
(Absolute maximum values, see page 5)

For scanned area of 6.6 mm x 8.8 mm
Grid No. 4 voltage . . . . 750 V
Grid No. 3 voltage . . . . 750 V
Grid No. 2 voltage . . . . 350 V
Grid No. 1 voltage:
Negative bias value . . . . 300 V
Positive bias value . . . . 0 V
Peak heater-cathode voltage:
Heater negative with respect to cathode . . . . 125 V
Heater positive with respect to cathode . . . . 60 V
Target voltage . . . . 80 V

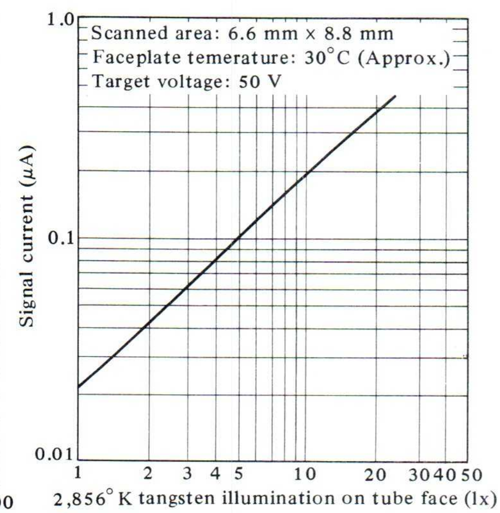
■ **Amplitude response**



■ **Relative response–beam current characteristics**



■ **Light transfer characteristic**



Faceplate:

Illumination . . . . 500 lx

Temperature . . . . 50°C

Field strength at center of focusing coil . . . . 56 G

Target voltage (Note 5) . . . . 50 V

Dark current . . . . 0.3 nA

Sensitivity (2,856°K tungsten illumination on tube face)

(Note 6, Note 7) . . . . W 350 μA/1 m

R 120 μA/1 m, G 150 μA/1 m, B 80 μA/1 m

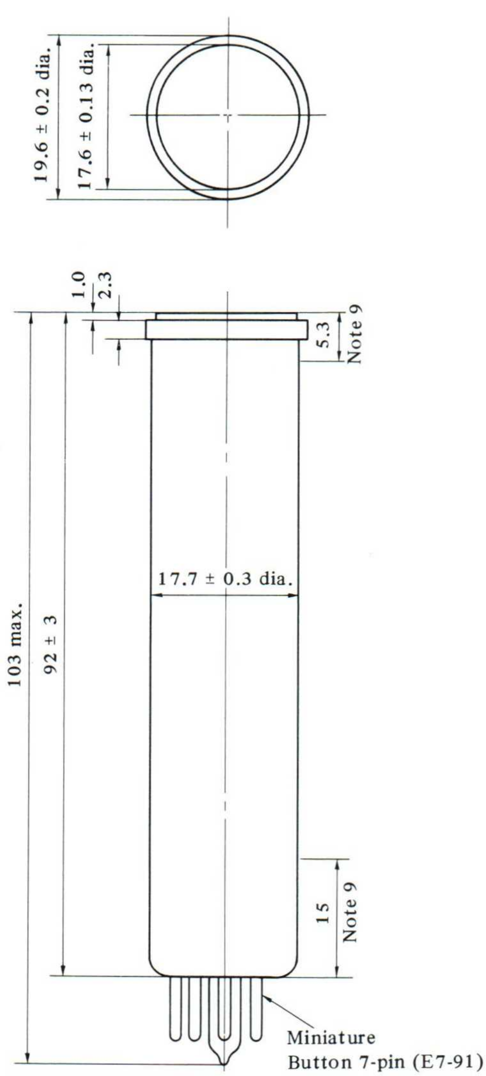
Gamma (Approx.) 1

Lag (Note 8) 2%

(With applying bias light equivalent 5 nA signal current.)

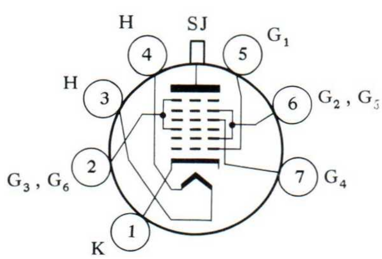
1. This value is an effective output impedance, which increases when a tube is inserted in the yoke assembly.
2. For yoke assembly, use a Hitachi SATICON yoke assembly SY2006 or its equivalent.
3. Grid No. 4 voltage must always be greater than Grid No. 3 voltage. The optimum ratio of Grid No. 3 to Grid No. 4 voltage depends on the yoke assembly used. This ratio should be adjusted for optimum performance with regard to signal uniformity and geometrical accuracy.
   This value was actually measured with a HITACHI YOKE ASSEMBLY SY2006. In this case, the recommended ratio of Grid No. 3 to Grid No. 4 voltage is 0.75.
4. Adjust the grid No. 1 voltage so that beam current reaches the rated value.
5. Set the target voltage precisely at 50 V. Lower voltage will cause deterioration of photoconductor performance, and higher voltage will reduce the service life. The target voltage and current characteristic represent their saturation characteristics. Accordingly, automatic sensitivity adjustment by varying the target voltage is impossible.
6. The sensitivity is a value obtained by measuring a signal current for faceplate illumination of 10 lx by employing a light source at 2,854°K color temperature and dividing the signal current by incident light flux.
   In the case of color sensitivity, the filters listed below are employed respectively, and the color sensitivity expressed in terms of μA/1 m of white light before the filter.
   R : FC-HS R1 filter
   G : FC-HS G1 filter
   B : FC-HS B1 filter
7. Spectral transmission factors of the filters are shown in Fig. 6. FC-HS filters are designed of which transmission factor resemble to that of FUJINON TVC-665 or TVC-555 series optical system.
   FUJI PHOTO OPTICAL CO., LTD.
   No. 324 1-chome Uetake-machi,
   Omiya, Saitama Pref.
   JAPAN
8. The lag is the percent of initial value of signal output current 1/20 seconds after illumination is removed, when the signal current is set at 0.2 μAp-p and the beam current at 0.4 μAp-p.
9. The outside diameter value 17.7±0.3 dia./mm shall not apply to the target-side 5.3 mm and the stem-side 15 mm section. The value for the stem-side 15 mm section shall be 18.0 dia./mm max..

Outline



Dimensions in mm

Base connection



Bottom view

■ FEATURES

- 2/3-inch diameter
- Magnetic focus, electrostatic deflection
- Remarkable low lag characteristic

■ APPLICATION

- For hand-held color TV cameras with very light weight and very low power consumption in educational, medical and high quality industrial applications.

■ GENERAL DATA

Heater voltage	6.3 ± 10%
Heater current	0.095 A
Direct interelectrode capacitance:	
Target (signal electrode) to all other electrodes (Note 1)	3.5 pF
Optical:	
Maximum useful scanned area	6.6 mm x 8.8 mm
Tube orientation	Horizontal scan is essentially parallel to the plane passing through the tube axis and No. 4 pin.
Thickness of faceplate	1.5 ± 0.2 mm
Reflective index of faceplate	1.505
Focusing method	Electrostatic
Deflection method	Magnetic
Overall length	103 mm max.
Greatest diameter	19.6 ± 0.2 mm
Operating position	Any

■ MAXIMUM RATINGS

(Absolute maximum values, see page 5)

For scanned area of 6.6 mm x 8.8 mm

Grid No. 3 + 6 voltage	750 V
Grid No. 2 + 5 voltage	350 V
Grid No. 4 voltage	200 V
Grid No. 1 voltage:	
Negative bias value	300 V
Positive bias value	0 V
Peak heater-cathode voltage:	
Heater negative with respect to cathode	125 V
Heater positive with respect to cathode	60 V
Target voltage	80 V
Faceplate:	
Illumination	500 lx
Temperature	50°C

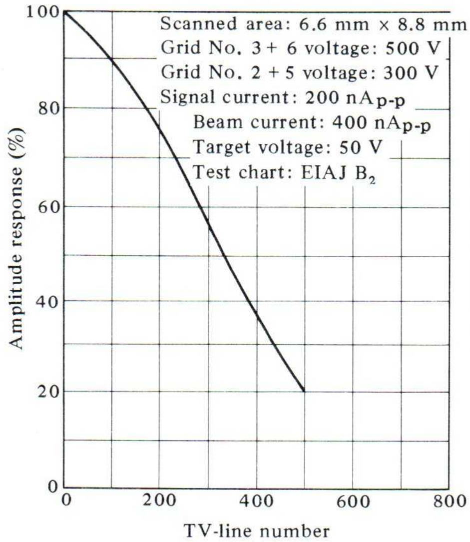
■ TYPICAL OPERATION (Note 2)

For scanned area of 6.6 mm x 8.8 mm

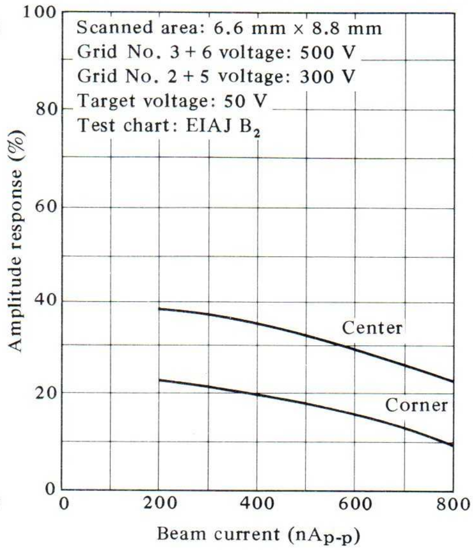
Faceplate temperature	25 ~ 35°C
Grid No. 3 + 6 voltage (Note 3)	500 V
Grid No. 2 + 5 voltage (Note 3)	300 V
Grid No. 4 voltage	Adjust
Grid No. 1 voltage for picture cutoff (Note 4)	−40 ~ −100 V

HITACHI

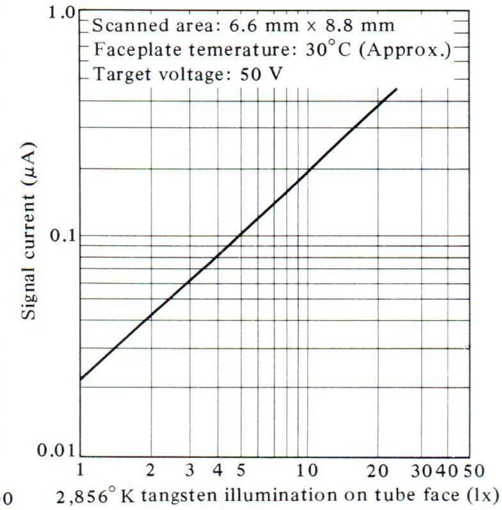
■ **Amplitude response**



■ **Relative response—beam current characteristics**



■ **Light transfer characterstic**



Minimum peak to peak blanking voltage:
- when applied to grid No. 1 . . . . 75 Vp-p
- when applied to cathode . . . . 20 Vp-p

Target voltage (Note 6) . . . . 50 V

Dark current . . . . 0.3 nA

Sensitivity (2,856°K tungsten illumination on tube face)
(Note 6, Note 7) . . . . W 350 μA/1 m
R 120 μA/1 m, G 150 μA/1 m, B 80 μA/1 m

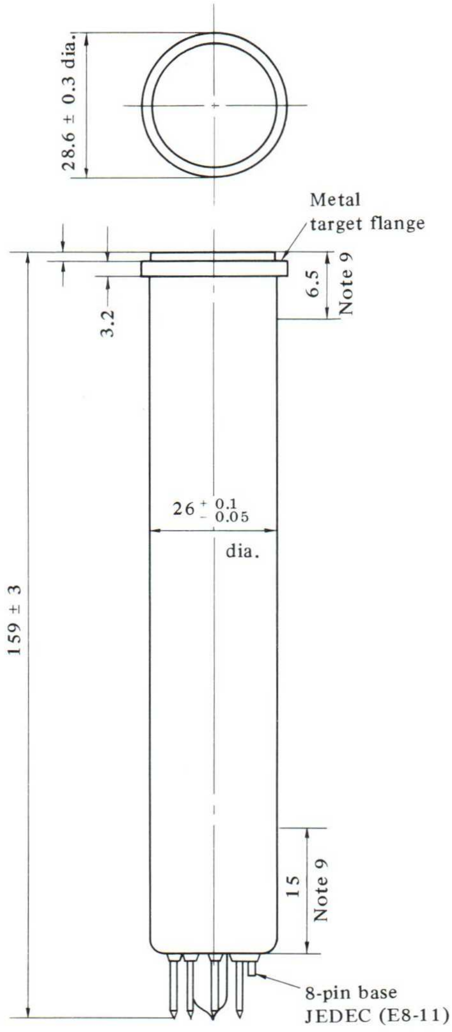
Gamma (Approx.) 1

Lag (Note 8) 2%
(With applying bias light equivalent 5 nA signal current.)

Note:

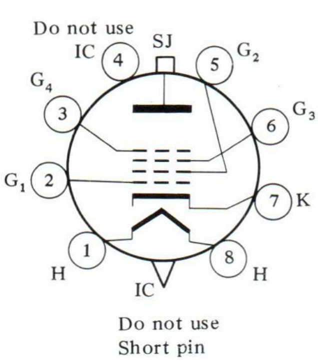
1. This value is an effective output impedance, which increases when a tube is inserted in the yoke assembly.
2. For yoke assembly, use a HITACHI SATICON YOKE ASSEMBLY SY2052 or its equivalent.
3. Grid No. 3 + 6 voltage must always be greater than Grid No. 2 + 5 voltage. The optimum ratio of Grid No. 2 + 5 to Grid No. 3 + 6 voltage depends on the yoke assembly used. This ratio should be adjusted for optimum performance with regard to signal uniformity and geometrical accuracy. This value was actually measured with a HITACHI YOKE ASSEMBLY SY2052. In this case, the recommended ratio of Grid No. 2 + 5 to Grid No. 3 + 6 voltage is 0.6.
4. Adjust the Grid No. 1 voltage so that beam current reaches the rated value.
5. Set the target voltage precisely at 50 V. Lower voltage will cause deterioration of photoconductor performance, and higher voltage will reduce the service life. The target voltage and current characteristic represent their saturation characteristics. Accordingly, automatic sensitivity adjustment by varying the target voltage is impossible.
6. The sensitivity is a value obtained by measuring a signal current for faceplate illumination of 10 lx by employing a light source at 2,856°K color temperature and dividing the signal current by incident light flux.
   In the case of color sensitivity, the filters listed below are employed respectively, and the color sensitivity expressed in terms of μA/1 m of white light before the filter.
   R : FC-HS R1 filter
   G : FC-HS G1 filter
   B : FC-HS B1 filter
7. Spectral transmission factors of the filters are shown in Fig. 6. FC-HS filters are designed of which transmission factor resemble to that of FUJINON TVC-665 or TVC-555 series optical system.
   FUJI PHOTO OPTICAL CO., LTD.
   No. 324 1-chome Uetake-machi,
   Omiya, Saitama Pref.
   JAPAN
8. The lag is the percent of initial value of signal output current 1/20 seconds after illumination is removed, when the signal current is set at 0.2 μAp-p and the beam current at 0.4 μAp-p.
9. The outside diameter value 17.7 ± 0.3 dia./mm shall not apply to the target-side 5.3 mm and the stem-side 15 mm section. The value for the stem-side 15 mm section shall be 18.0 dia./mm max..

Outline



Dimensions in mm

Base connection



Bottom view

■ FEATURES

- 1-inch diameter
- Magnetic focus, magnetic deflection
- Low lag
- High resolution

■ APPLICATION

- For high performance CCTV studio use color camera

■ GENERAL DATA

Heater voltage	6.3 V ± 10%
Heater current	0.095 A
Direct interelectrode capacitance:	
Target (signal electrode) to all other electrodes (Note 1)	4.6 pF
Optical:	
Maximum useful scanned area	9.5 mm x 12.7 mm
Tube orientation	Horizontal scan is essentially parallel to the plane passing through the tube axis and short pin.
Thickness of faceplate	2.39 ± 0.2 mm
Reflective index of faceplate	1.505
Focusing method	Magnetic
Deflection method	Magnetic
Overall length	159 ± 3 mm max.
Greatest diameter	28.6 ± 0.3 mm
Operating position	Any

■ MAXIMUM RATINGS

(Absolute maximum values, see page 5)

For scanned area of 9.5 mm x 12.7 mm

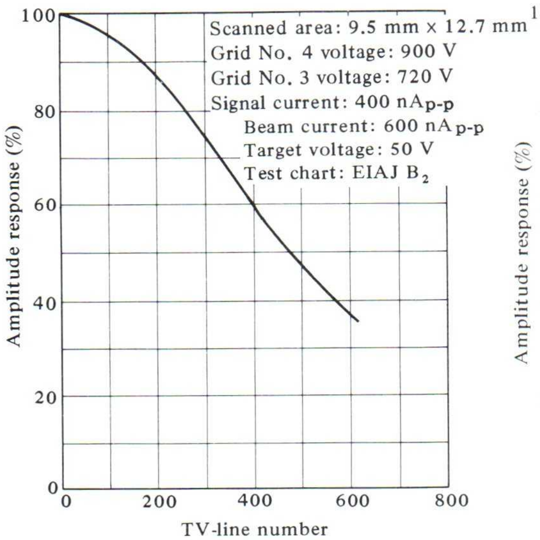
Grid No. 4 voltage	1,500 V
Grid No. 3 voltage	1,000 V
Grid No. 2 voltage	350 V
Grid No. 1 voltage:	
Negative bias value	300 V
Positive bias value	0 V
Peak heater-cathode voltage:	
Heater negative with respect to cathode	125 V
Heater positive with respect to cathode	60 V
Target voltage	80 V
Faceplate:	
Illumination	500 lx
Temperature	50°C

■ TYPICAL OPERATION (Note 2)

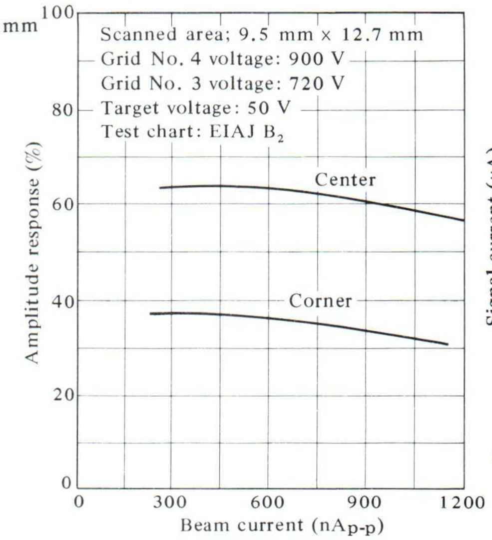
For scanned area of 9.5 mm x 12.7 mm

Faceplate temperature	25 ~ 35°C
Grid No. 4 voltage (Note 3)	800 V
Grid No. 3 voltage (Note 3)	640 V
Grid No. 2 voltage	300 V
Grid No. 1 voltage for picture cutoff (Note 4)	–40 ~ –100 V

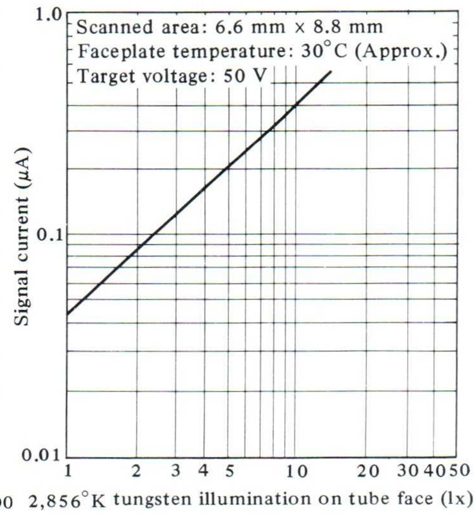
■ **Amplitude response**



■ **Relative response—beam current characteristics**



■ **Light transfer characteristic**

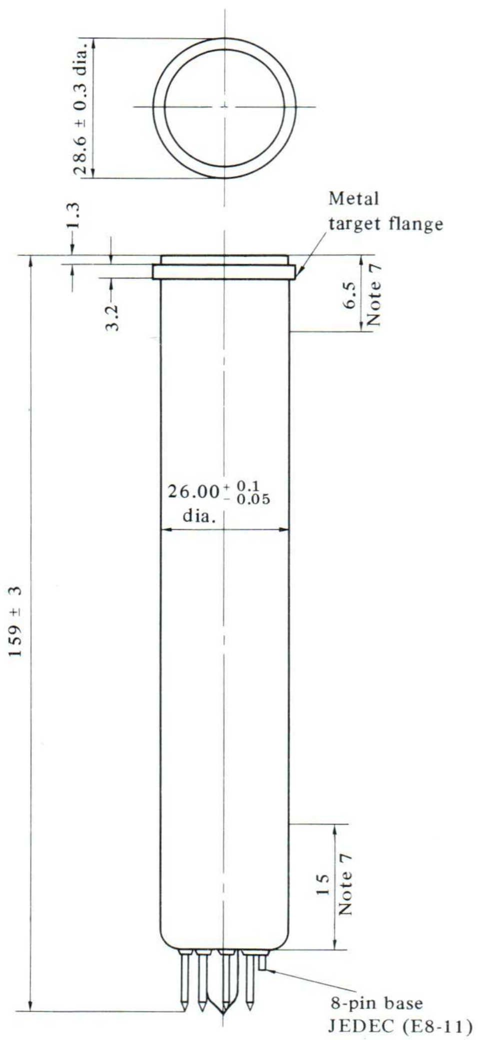


Minimum peak to peak blanking voltage:
- when applied to grid No. 1 . . . . 75 Vp-p
- when applied to cathode . . . . 20 Vp-p

Field strength at center of focusing coil . . . . 64 G
Target voltage (Note 5) . . . . 50 V
Dark current . . . . 0.6 nA
Sensitivity (2,856°K tungsten illumination on tube face)
(Note 6, Note 7) . . . . W 350 μA/1 m
R 120 μA/1 m, G 150 μA/1 m, B 80 μA/1 m
Gamma (Approx.) 1
Lag (Note 8) 2%
(With applying bias light equivalent 5 nA signal current.)

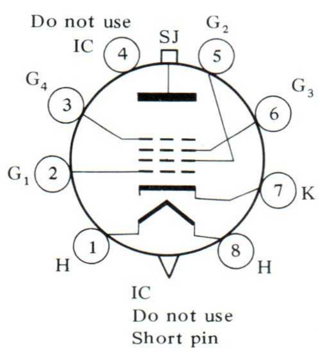
Note:
1. This value is an effective output impedance, which increases when a tube is inserted in the yoke assembly.
2. For yoke assembly, use a Hitachi SATICON yoke assembly SY2501 or its equivalent.
3. Grid No. 4 voltage must always be greater than Grid No. 3 voltage. The optimum ratio of Grid No. 3 to Grid No. 4 voltage depends on the yoke assembly used. This ratio should be adjusted for optimum performance with regard to signal uniformity and geometrical accuracy.
   This value was actually measured with a HITACHI YOKE ASSEMBLY SY2501 or equivalent. In this case, the recommended ratio of Grid No. 3 to Grid No. 4 voltage is 0.80.
4. Adjust the Grid No. 1 voltage so that beam current reaches the rated value.
5. Set the target voltage precisely at 50 V. Lower voltage will cause deterioration of photoconductor performance, and higher voltage will reduce the service life. The target voltage and current characteristic represent their saturation characteristics. Accordingly, automatic sensitivity adjustment by varying the target voltage is impossible.
6. The sensitivity is a value obtained by measuring a signal current for faceplate illumination of 10 lx by employing a light source at 2,856°K color temperature and dividing the signal current by incident light flux.
   In the case of color sensitivity, the filters listed below are employed respectively, and the color sensitivity expressed in terms of μA/1 m of white light before the filter.
   R : FC-HS R1 filter
   G : FC-HS G1 filter
   B : FC-HS B1 filter
7. Spectral transmission factors of the filters are shown in Fig. 6. FC-HS filters are designed of which transmission factor resemble to that of FUJINON TVC-665 or TVC-555 series optical system.
   FUNI PHOTO OPTICAL CO., LTD.
   No. 324 1-chome Uetake-machi,
   Omiya, Saitama Pref.
   JAPAN
8. The lag is the percent of initial value of signal output current 1/20 seconds after illumination is removed, when the signal current is set at 0.2 μAp-p and the beam current at 0.4 μAp-p.
9. The outside diameter value 26.00 $\pm^{0.10}_{0.05}$ dia./mm shall not apply to the target-side 6.5 mm and the stem-side 15 mm section. The value for the stem-side 15 mm section shall be 26.1 dia./mm max..

Outline



Dimensions in mm

Base connection



Bottom view

■ FEATURES

- 1-inch diameter
- Magnetic focus, magnetic deflection
- High resolution

■ APPLICATION

- For TV viewing of X-ray excited image screen

■ GENERAL DATA

Heater voltage	6.3 V ± 10%
Heater current	0.095 A
Direct interelectrode capacitance:	
Target (signal electrode) to all other electrodes (Note 1)	4.6 pF
Optical:	
Maximum useful scanned area	9.5 mm x 12.7 mm
Tube orientation	Horizontal scan is essentially parallel to the plane passing through the tube axis and short pin.
Thickness of faceplate	1.5 ± 0.2 mm
Reflective index of faceplate	1.505
Facusing method	Magnetic
Deflection method	Magnetic
Overall length	159 ± 3 mm
Greatest diameter	28.6 ± 0.3 mm
Operating position	Any

■ MAXIMUM RATINGS

(Absolute maximum values, see page 5)

For scanned area of 9.5 mm x 12.7 mm

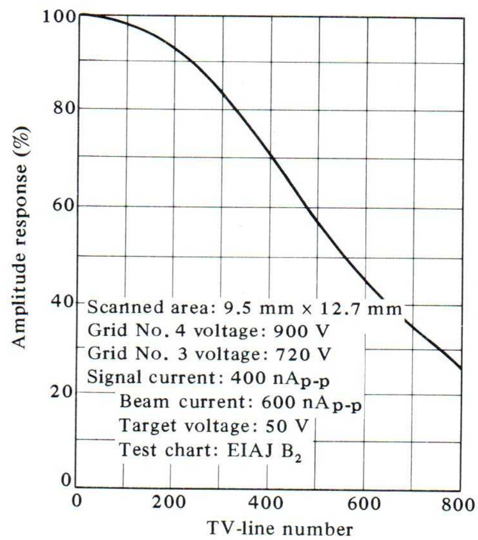
Grid No. 4 voltage	1,500 V
Grid No. 3 voltage	1,000 V
Grid No. 2 voltage	750 V
Grid No. 1 voltage:	
Negative bias value	300 V
Positive bias value	0 V
Peak heater-cathode voltage:	
Heater negative with respect to cathode	125 V
Heater positive with respect to cathode	60 V
Target voltage	80 V
Faceplate:	
Illumination	500 lx
Temperature	50°C

■ TYPICAL OPERATION (Note 2)

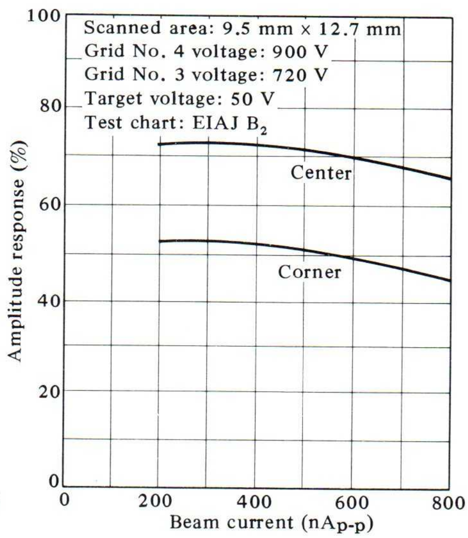
For scanned area of 9.5 mm x 12.7 mm

Faceplate temperature	25 ~ 35°C
Grid No. 4 voltage	900 V
Grid No. 3 voltage	720 V
Grid No. 2 volrage	300 V
Grid No. 1 voltage for picture cutoff	−40 ~ −100 V
Minimum peak to peak blanking voltage:	
when applied to grid No. 1	75 Vp-p
when applied to cathode	20 Vp-p

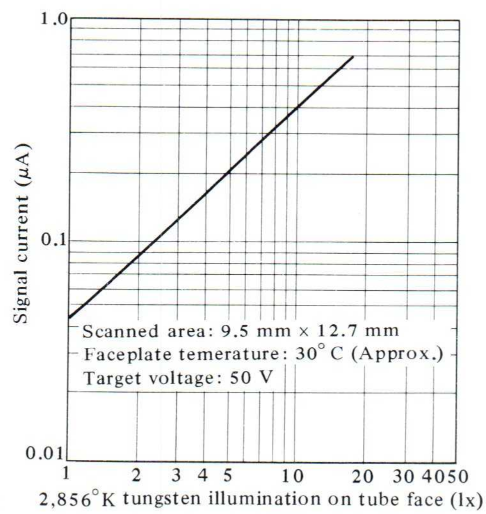
■ Amplitude response



■ Relative response–beam current characteristics



■ Light transfer characteristic

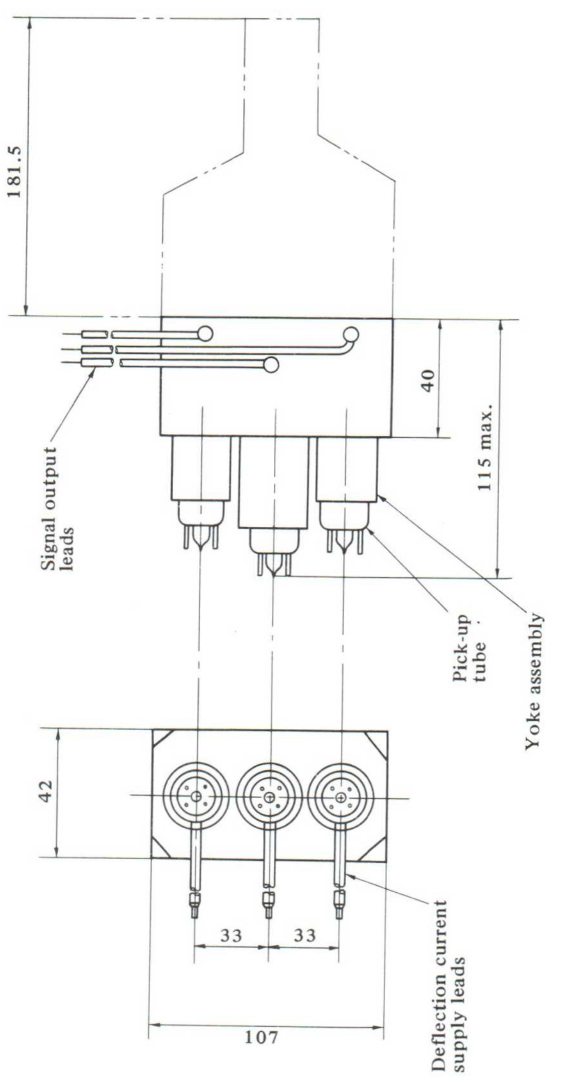


Field strength at center of focusing coil . . . . 68 G
Target voltage (Note 3) . . . . 50 V
Dark current . . . . 0.3 nA
Sensitivity (2,854°K tungsten illumination on tube face)
(Note 4, Note 5) . . . . W 350 μA/1 m
R 120 μA/1 m, G 150 μA/1 m, B 80 μA/1 m
Gamma (Approx.) 1
Lag (Note 6) 5.5%

Note:

1. This value is an effective output impedance, which increases when a tube is inserted in the yoke assembly.
2. For yoke assembly, use a Hitachi SATICON yoke assembly SY2501 or its equivalent.
3. Set the target voltage precisely at 50 V. Lower voltage will cause deterioration of photoconductor performance, and higher voltage will reduce the service life. The target voltage and current characteristic represent their saturation characteristics. Accordingly, automatic sensitivity adjustment by varying the target voltage is impossible.
4. The sensitivity is a value obtained by measuring a signal current for faceplate illumination of 10 lx by employing a light source at 2,856°K color temperature and dividing the signal current by incident light flux.
   In the case of color sensitivity, the filters listed below are employed respectively, and the color sensitivity expressed in terms of μA/1 m of white light before the filter.
   R : FC-HS R1 filter
   G : FC-HS G1 filter
   B : FC-HS B1 filter
5. Spectal transmission factors of the filters are shown in Fig. 6. FC-HS filters are designed of which transmission factor resemble to that of FUJINON TVC-665 or TVC-555 series optical system.
   FUJI PHOTO OPTICAL CO., LTD.
   No. 324 1-chome Uetake-machi,
   Omiya, Saitama Pref.
   JAPAN
6. The lag is the percent of initial value of signal output current 1/20 seconds after illumination is removed, when the signal current is set at 0.2 μAp-p, and the beam current at 0.4 μAp-p.
7. The outside diameter value $26.00 \pm^{0.1}_{0.05}$ dia./mm shall not apply to the target-side 6.5 mm and the stem-side 15 mm section. The value for the stem-side 15 mm section shall be 26.1 dia./mm max.. Regarding the target side, refer to Note 2 below.

Outline



Dimensions in mm

■ FEATURES

- Integrated pickup component with 2/3-inch diameter 3-SATICON tubes.
- Electrostatic focus, magnetic deflection.
- Low power Consumption.
- Easy adjustment.
- Reliable and stable operation.
- Biaslight source built-in for each channel.

■ APPLICATION

- For high quality general use three tubes color TV camera.

■ GENERAL DATA

Heater:	
Voltage	6.3 V
Current	285 (95 x 3) mA
Focussing method	Electrostatic
Deflection method	Magnetic
Minimum peak to peak blanking voltage:	
When applied to Grid No. 1	75 Vp-p
When applied to cathode	20 Vp-p
Direct interelectrode capacitance:	
Target to all other electrodes	5 pF
Optical:	
Scanned area	6.6 mm x 8.8 mm
Optical system	TV-306A made by FUJI PHOTO OPTICAL CO., LTD. (Note 1)
Dimensional outline	115(L) x 107(H) x 42(W)
Base	Miniature button 7 pin EIA E7-91
Weight	280 g

■ MAXIMUM RATINGS

(Absolute maximum ratings, see page 5)

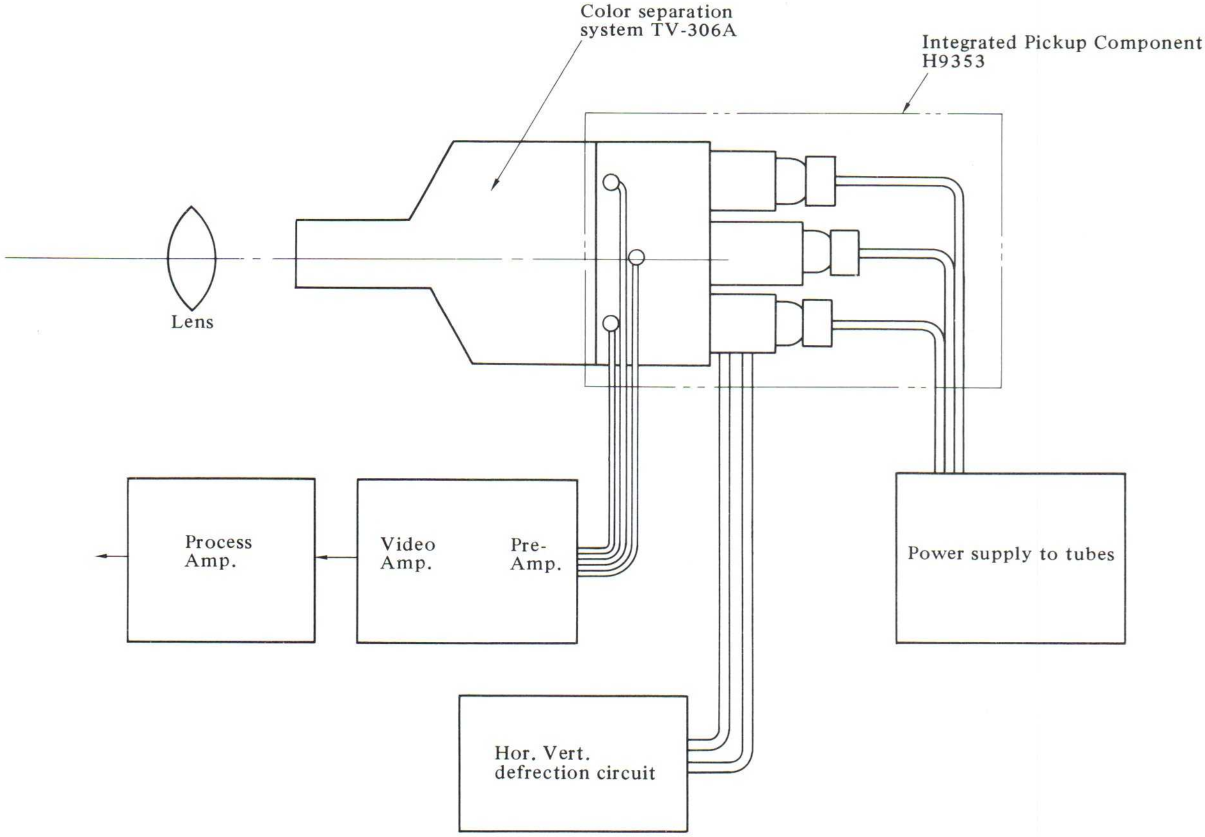
Grid No. 3+6	750 V
Grid No. 2+5	350 V
Grid No. 4	200 V
Grid No. 1	0 / −300 V
Peak heater cathode voltage:	
Heater negative with respect to cathode	125 V
Heater positive with respect to cathode	10 V
Target voltage	80 V
Faceplate temperature	50°C
Faceplate illumination	500 lx
Vibration	2 G
Mechanical shock	40 G

■ TYPICAL OPERATION:

(with using TV-306A optical system)

Scanned area	6.6 mm x 8.8 mm
Faceplate temperature	25 to 35°C
Grid No. 3+6 voltage (Note 2)	500 V
Grid No. 2+5 voltage (Note 2)	300 V
Grid No. 4 voltage	70 to 90 V
Grid No. 1 voltage for picture cutoff	−45 to −100 V
Target voltage (Note 3)	50 V

Block diagram of fundamental circuit



Dark current .... 0.3 nA
Gamma .... approx. 1
Lag (per cent of initial value of signal output current 1/20 seconds after illumination is removed, with applying bias light which is equivalent 5 nA signal current) .... less than 2%
Sensitivity (3200°K light source):
Standard required illumination .... 2000 lx with lens opening of f.4
Color sensitivity at faceplate illumination of 10 lx:
Red .... 38 nA
Green .... 74 nA
Blue .... 37 nA
Resolution at center of picture .... 400 TV lines min.
Registration: (percent of picture height)
Inside circle of 80% of picture height ..... less than 0.2%
The other area .... less than 1%

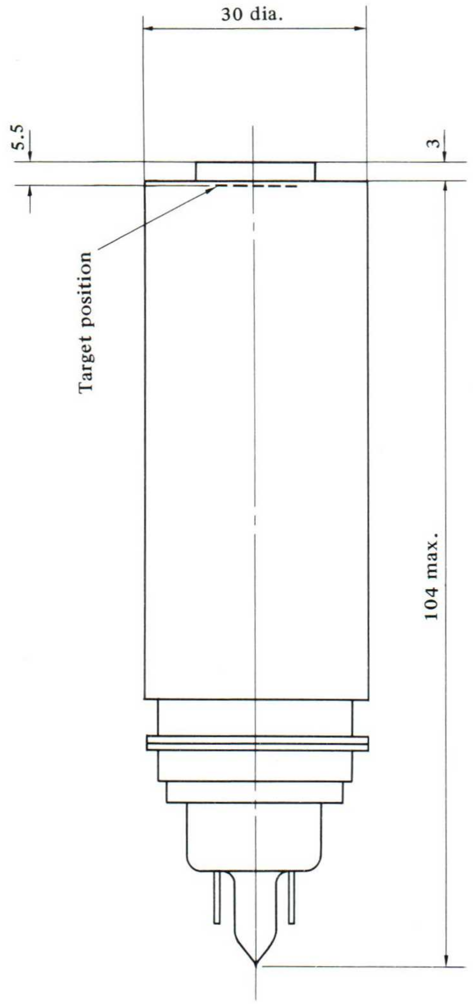
■ ELECTRICAL DATA OF YOKE ASSEMBLY:

Horizontal deflection coil:
Inductance .... 0.8 mH
Resistance .... 5 Ω
Current .... approx. 100 mAp-p
Vertical deflection coil:
Inductance .... 10 mH
Resistance .... 100 Ω
Current .... approx. 20 mAp-p

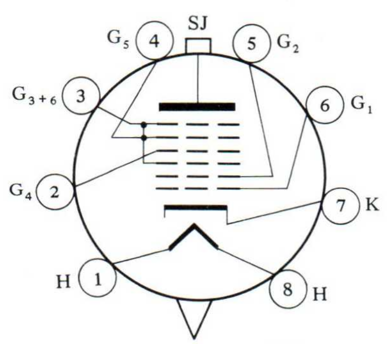
Note:

1. FUJI PHOTO OPTICAL CO., LTD.
   No. 324 1-chome Uetake-machi, Omiya, Saitama Pref., Japan
2. Grid No. 3+6 voltage must always be greater than Grid No. 2+5 voltage. The optimum ratio of Grid No. 2+5 to Grid No. 3+6 voltage depends on the yoke assembly used. This ratio should be adjusted for optimum performance with regard to signal uniformity and geometrical accuracy.
   This value was actually measured with a HITACHI YOKE ASSEMBLY SY2051. In this case, the recommended ratio of Grid No. 2+5 to Grid No. 3+6 voltage is 0.6.
3. Set the target voltage precisely at 50 V. Lower voltage will cause deterioration of photoconductor performance, and higher voltage will reduce the service life. The target voltage and current characteristic represent their saturation characteristics. Accordingly, automatic sensitivity adjustment by varying the target voltage is impossible.

Outline



Dimensions in mm



Short index pin(IC)

Bottom view

■ FEATURES

- 2/3-inch stripe fiter integrated single color tube with a yoke assembly.
- Electrostatic focus and magnetic diflection.
- High sensitivity.
- High resolution.
- High stability.
- Light weight.
- Easy adjustment.

■ APPLICATION

- Single tube color TV camera.

■ GENERAL DATA

Heater voltage	6.3 V ± 10%
Heater current	0.095A
Direct interelectrode capacitance:	
Target (signal electrode) to all other electrodes	3.5 pF
Optical:	
Maximum useful scanned area	6.6 mm x 8.8 mm
Color signal carrier frequency	3.6 MHz/red 4.6 MHz/blue
Grid No. 1 voltage for picture cutoff	–40~–100 V
Minimum peak to peak blanking voltage:	
when applied to grid No. 1	75 Vp-p
when applied to cathode	20 Vp-p
Focusing method	Electrostatic
Deflection method	Magnetic
Overall length	108 mm max.
Greatest diameter	30 ± 0.2 mm
Operating position	Any

■ MAXIMUM RATINGS

(Absolute maximum values, see page 5)

For scanned area of 6.6 mm x 8.8 mm

Grid No. 3+6 voltage	1,200 V
Grid No. 5 voltage	800 V
Grid No. 4 voltage	300 V
Grid No. 2 voltage	350 V
Grid No. 1 voltage:	
Negative bias value	300 V
Positive bias value	0 V
Peak heater-cathode voltage:	
Heater negative with respect to cathode	125 V
Heater positive with respect to cathode	10 V
Target voltage	80 V
Faceplate:	
Illumination	500 lx
Temperature	50°C

■ TYPICAL OPERATION

For scanned area of 6.6 mm x 8.8 mm

Faceplate temperature	25~35°C
Grid No. 3+6 voltage (Note 1)	1,000 V
Grid No. 5 voltage (Note 1)	600 V
Grid No. 4 voltage	Adjust
Grid No. 2 voltage	300 V
Grid No. 1 voltage	Adjust
Target voltage (Note 2)	50 V
Signal current (at intensity of 20 lux faceplate illumination uniformly distributed over a white object)	0.30 μAp-p
Color carrier wave amplitude	
Red	0.08 μAp-p
Blue	0.1 μAp-p
Lag (Residual signal current 50 msec. after illumination is removed)	3%

■ ELECTRICAL DATA OF YOKE ASSEMBLY

Horizontal deflection coil:	
Inductance	0.8 mH
Resistance	5 Ω
Current	approx. 100 mAp-p
Vertical deflection coil:	
Inductance	10 mH
Resistance	100 Ω
Current	approx. 20 mAp-p

Note:

1. Grid No. 3+6 voltage must always be greater than Grid No. 5 voltage. The optimum ratio of Grid No. 5 to Grid No. 3+6 voltage depends on the yoke assembly used. This ratio should be adjusted for optimum performance with regard to signal uniformity and geometrical accuracy.
   This value was actually measured with a HITACHI YOKE ASSEMBLY SY2051. In this case, the recommended ratio of Grid No. 5 to Grid No. 3+6 voltage is 0.6.
2. Set the target voltage precisely at 50 V. Lower voltage will cause deterioration of photoconductor performance, and higher voltage will reduce the service life. The target voltage and current characteristic represent their saturation characteristics. Accordingly, automatic sensitivity adjustment by varying the target voltage is impossible.

SY2001

■ FEATURES

- Front loading.
- Completed magnetic shield.
- Very small misregistration.
- First stage of preamplifier can be mounted.

■ APPLICATION

- 2/3-inch SATICON H8397A.

■ GENERAL DATA

Deflecting method	Magnetic
Focussing method	Magnetic
Greatest diameter	41.8 ± 0.2 mm
Overall length (approx.)	98.5 mm
Weight (approx.)	330 g

■ ELECTRICAL DATA

	Inductance (mH)	Resistance (ohm)
Vertical deflection coil	20	150
Horizontal deflection coil	1.18	3.8
Alignment coil	–	210
Focus coil	–	23

■ REQUIRED CURRENTS FOR TYPICAL OPERATION

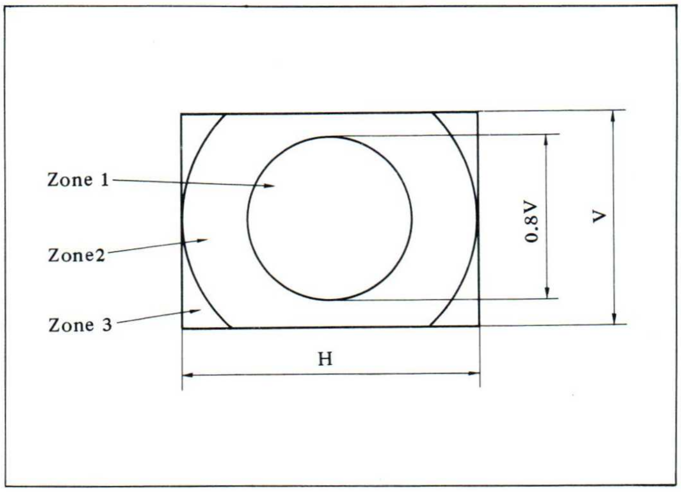
(Grid No. 3 voltage 290 V, Grid No. 4 voltage 425 V, measured with the H8397A)

Vertical deflection coil (approx.)	30 mAp-p
Horizontal deflection coil (approx.)	130 mAp-p
Alignment coils	
Current	32 mA DC
Field strength	4G
Focus coil	
Current	200 mA DC
Field strength	56G

■ MISREGISTRATION

Zone 1	less than 0.05% of picture height
Zone 2	less than 0.2% of picture height
Zone 3	less than 0.3% of picture height

Zones are shown as below.

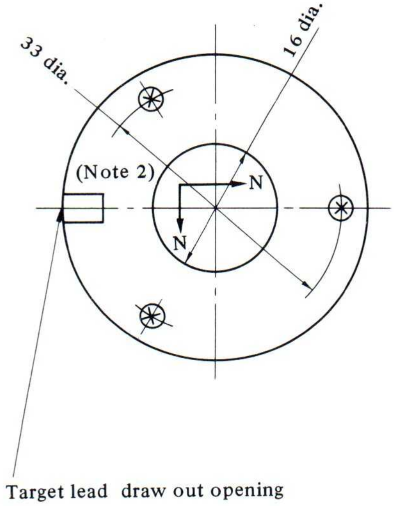


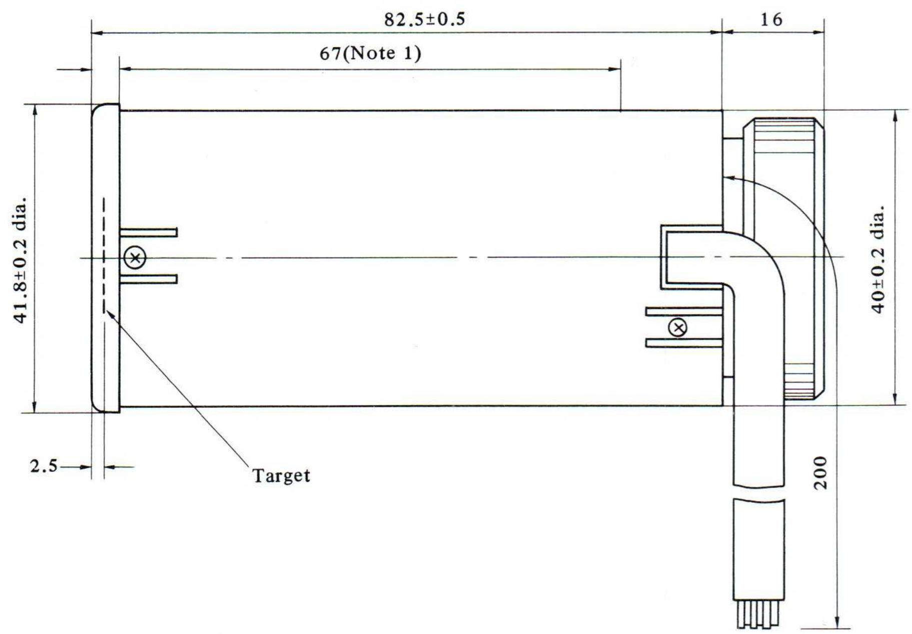
Note:

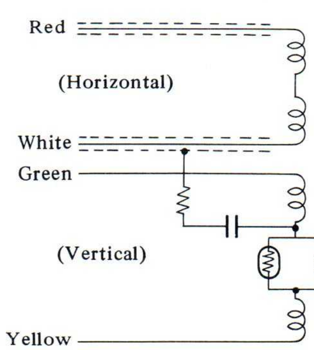
1. Within this distance, diameter of outer shielding case is 40 $^{+0}_{-0.15}$ dia.
2. N pole is shown, when positive voltage is applied to the red and green leads of horizontal and vertical deflection coils, respectively.
3. The polarity of the focus coil should be such that the north seeking-pole is attracted to the image end of the coil.

■ OUTLINE

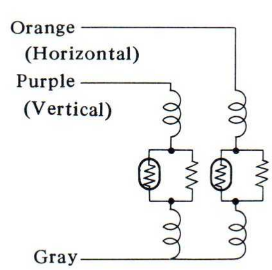
Dimensions in mm



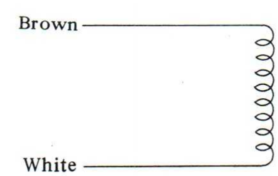




Deflection coils



Alignment coils



Focus coil (Note 3)

HITACHI SATICON YOKE ASSEMBLY **SY2002**

■ FEATURES

- Rear loading.
- Completed magnetic shield.
- Very small misregistration.
- Small sized and light weight.

■ APPLICATION

- 2/3-inch SATICON H8397A.

■ GENERAL DATA

Deflecting method	Magnetic
Focussing method	Magnetic
Greatest diameter	$37^{+0}_{-0.2}$ mm
Overall length (approx.)	98 mm
Weight (approx.)	230 g

■ ELECTRICAL DATA

	Inductance (mH)	Resistance (ohm)
Vertical deflection coil	20	130
Horizontal deflection coil	1.3	5.5
Alignment coil	–	230
Focus coil	–	24

■ REQUIRED CURRENTS FOR TYPICAL OPERATION

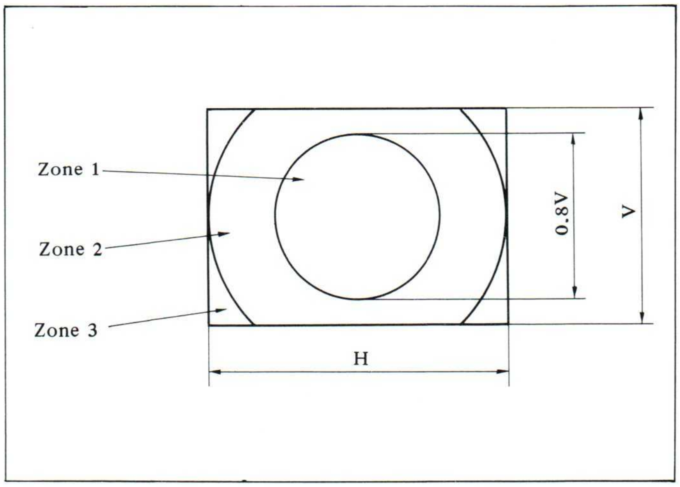
(Grid No. 3 voltage 290 V, Grid No. 4 voltage 425 V, measured with the H8397A)

Vertical deflection coil (approx.)	35 mAp-p
Horizontal deflection coil (approx.)	200 mAp-p
Alignment coils	
Current	30 mA DC
Field strength	4G
Focus coil	
Current	165 mA DC
Field strength	59G

■ MISREGISTRATION

Zone 1	less than 0.05% of picture height
Zone 2	less than 0.2% of picture height
Zone 3	less than 0.3% of picture height

Zones are shown as below.



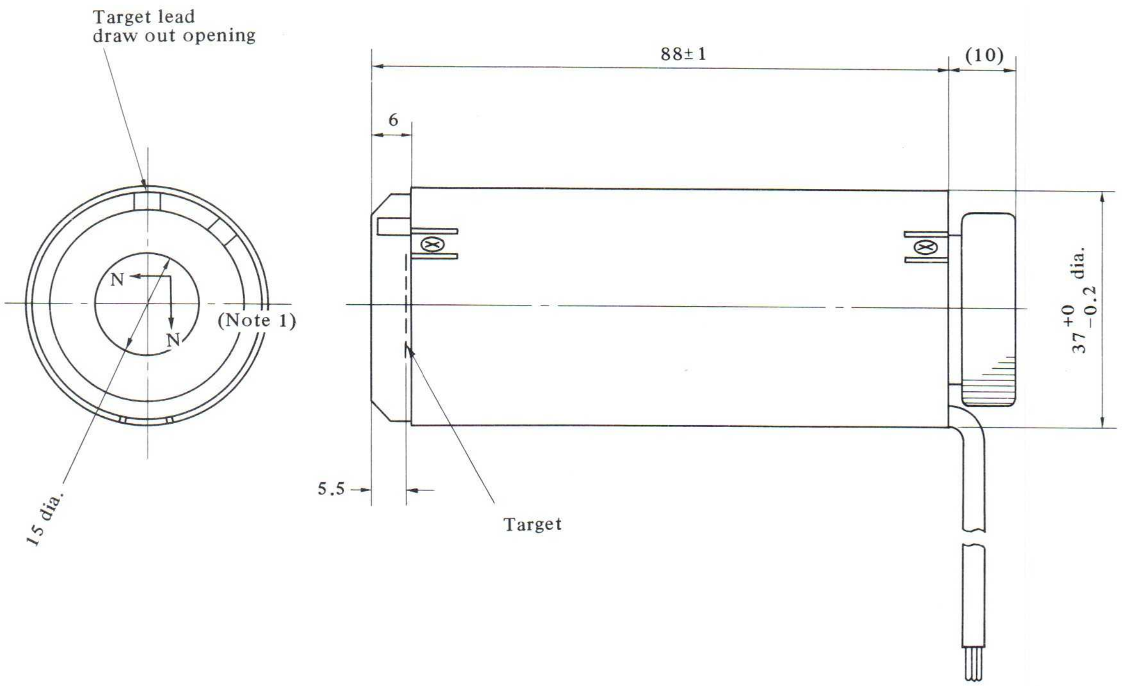
Note:

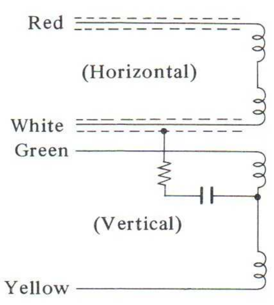
1. N pole is shown, when positive voltage is applied to the red and green leads of horizontal and vertical deflection coils, respectively.
2. The polarity of the focus coil should be such that north seeking pole is attracted to the image end of the coil.

HITACHI

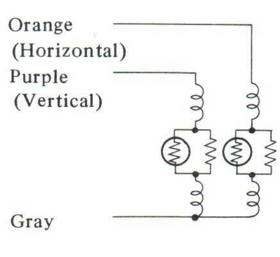
■ OUTLINE

Dimensions in mm





Deflection coils



Alignment coils

Focus coil (Note 2)

SY2003A

■ FEATURES

- Rear leading.
- Completed magnetic shield.
- Very small misregistratition.
- Bias light source built-in.

■ APPLICATION

- 2/3-inch SATICON H8397A.

■ GENERAL DATA

Deflecting method	Magnetic
Focussing method	Magnetic
Greatest diameter	$36.4^{+0}_{-0.2}$ mm
Overall length (approx.)	98 mm
Weight (approx.)	230 g

■ ELECTRICAL DATA

	Inductance (mH)	Resistance (ohm)
Vertical deflection coil	20	130
Horizontal deflection coil	1.3	5.5
Alignment coil	–	230
Focus coil	–	23

■ REQUIRED CURRENTS FOR TYPICAL OPERATION

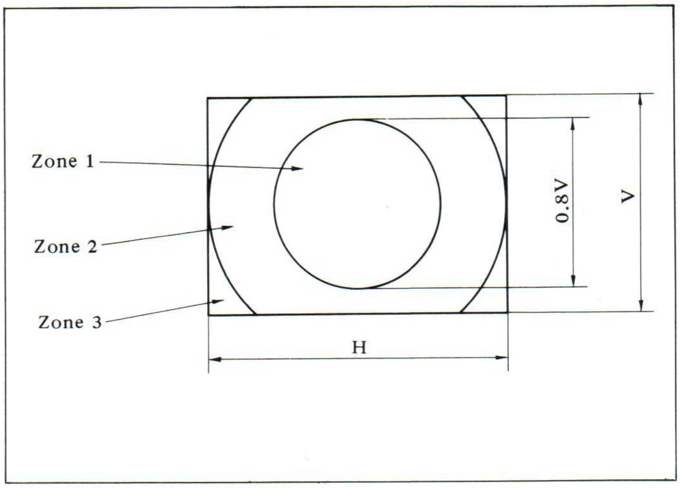
(Grid No. 3 voltage 290 V, Grid No. 4 voltage 425 V, measured with the H8397A)

Vertical deflection coil (approx.)	35 mAp-p
Horizontal deflection coil (approx.)	200 mAp-p
Alignment coils	
Current	30 mA DC
Field strength	4G
Focus coil	
Current	165 mA DC
Field strength	56G
Bias light	
Voltage	7~8 V
Current (approx.)	0.5 mA

■ MISREGISTRATION

Zone 1	less than 0.1% of picture height
Zone 2	less than 0.2% of picture height
Zone 3	less than 0.4% of picture height

Zones are shown as below.

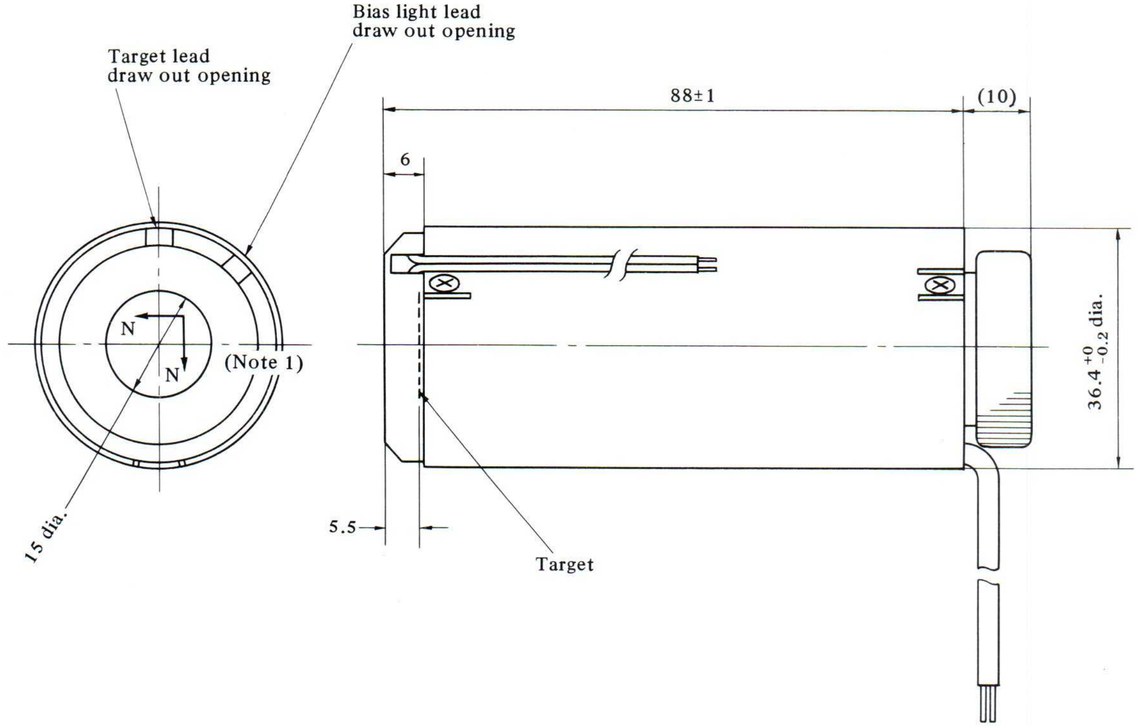


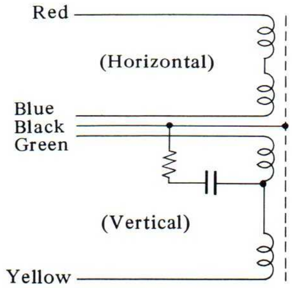
Note:

1. N pile is shown, when positive voltage is applied to the red and green leads of horizontal and vertical deflection coils, respectively.
2. The polarity of the focus coil should be such that north seeking pole is attracted to the image end of the coil.

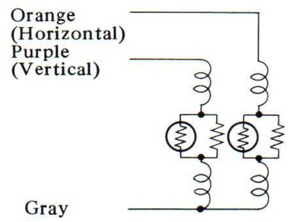
■ OUTLINE

Dimensions in mm

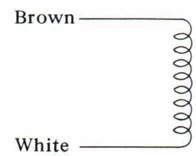




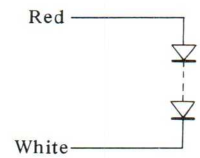
Deflection coils



Alignment coils



Focus coil (Note 2)



Bias light

■ FEATURES

- Small sized and light weight.
- Bias light source built-in.
- For industrial use.

■ APPLICATION

- 2/3-inch SATICON H9311A.

■ GENERAL DATA

Deflecting method	Magnetic
Focussing method	Magnetic
Greatest diameter	38.3 mm
Overall length (approx.)	93 mm
Weight (approx.)	120 g

■ ELECTRICAL DATA

	Inductance (mH)	Resistance (ohm)
Vertical deflection coil	32	142
Horizontal deflection coil	0.85	4.2
Focus coil	–	37

■ REQUIRED CURRENT FOR TYPICAL OPERATION

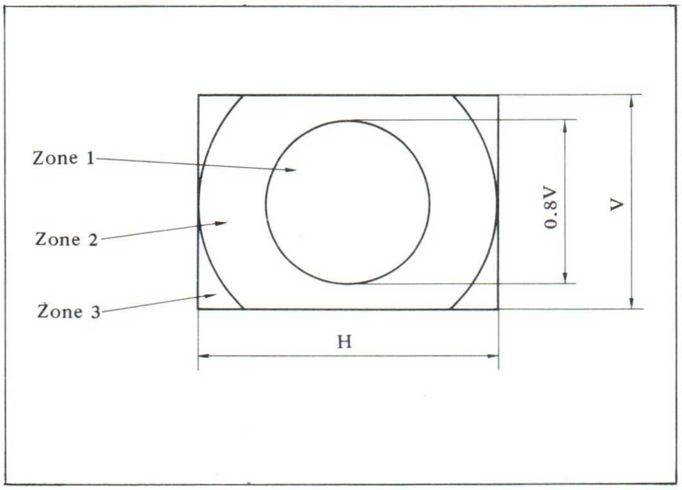
(Grid No. 3 voltage 300 V, Grid No. 4 voltage 400 V, measured with the H9311A)

Vertical deflection coil (approx.)	35 mAp-p
Horizontal deflection coil (approx.)	200 mAp-p
Field strength	0~4G
Focus coil	
Current	145 mA DC
Field strength	56G

■ MISREGISTRATION

Zone 1	less than 0.2% of picture height
Zone 2	less than 0.4% of picture height
Zone 3	less than 0.8% of picture height

Zones are shown as below.

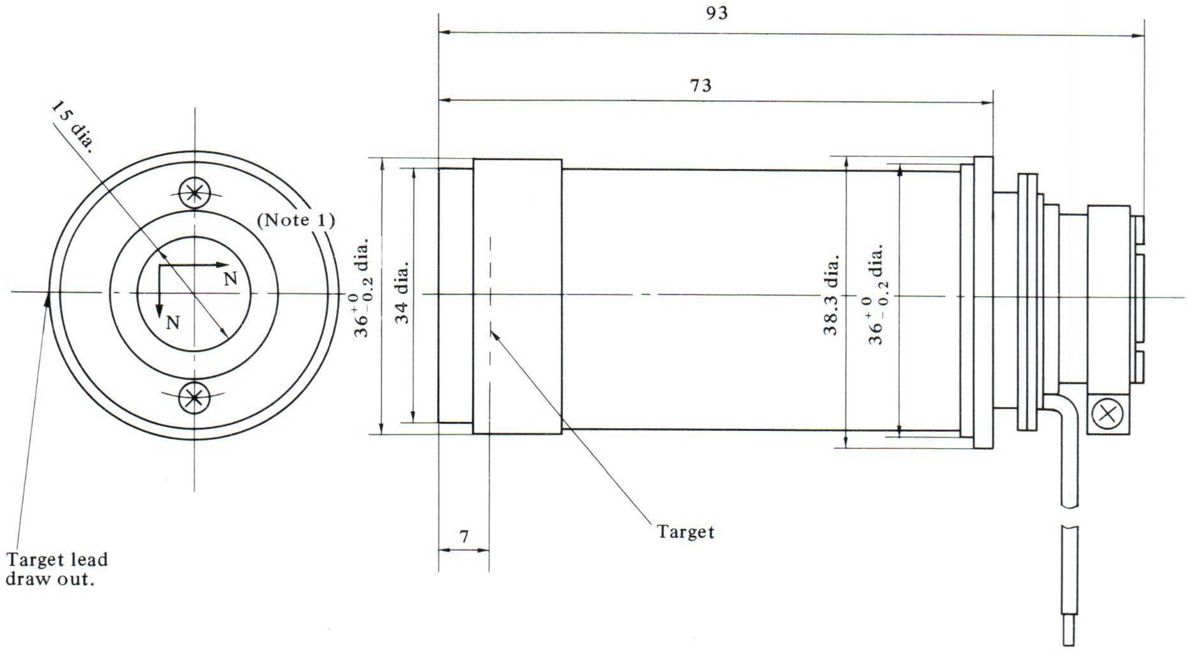


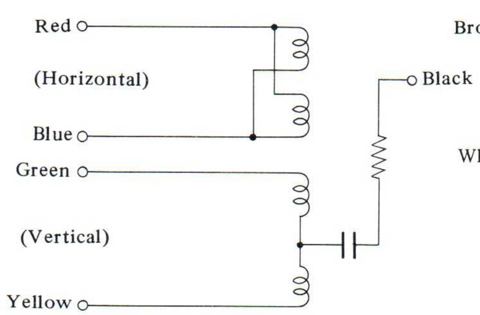
Note:

1. N pole is shown, when positive voltage is applied to the red and green leads of horizontal and vertical deflection coils, respectively.
2. The polarity of the focus coil should be such that north seeking pole is attracted to the image end of the coil.

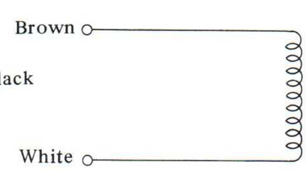
■ OUTLINE

Dimensions in mm





Deflection coils



Focus coil (Note 2)

SY2010

■ FEATURES

- Front loading.
- Completed magnetic shield.
- Small sized and light weight.
- First stage of the preamplifier can be mounted.

■ APPLICATION

- 2/3-inch SATICON H9336.

■ GENERAL DATA

Deflecting method	Magnetic
Focussing method	Magnetic
Applicable tube	H9336
Greatest diameter	38 ± 0.2 mm
Overall length (approx.)	72 mm
Weight (approx.)	200 g

■ ELECTRICAL DATA

	Inductance (mH)	Resistance (ohm)
Vertical deflection coil	5.5	32.5
Horizontal deflection coil	1.3	5.5
Alignment coil	–	320
Focus coil	–	4

■ REQUIRED CURRENTS FOR TYPICAL OPERATION

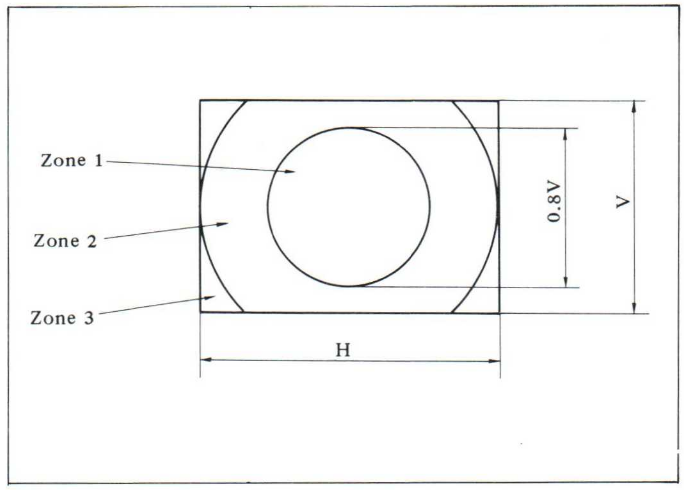
(Grid No. 3 voltage 300 V, Grid No. 4 voltage 400 V, measured with the H9336)

Vertical deflection coil (approx.)	90 mAp-p
Horizontal deflection coil (approx.)	200 mAp-p
Alignment coils	
Current	20 mA DC
Field strength	4G
Focus coil	
Current	475 mA DC
Field strength	82.5G

■ MISREGISTRATION

Zone 1	less than 0.2% of picture height
Zone 2	less than 0.4% of picture height
Zone 3	less than 0.8% of picture height

Zones are shown as below.



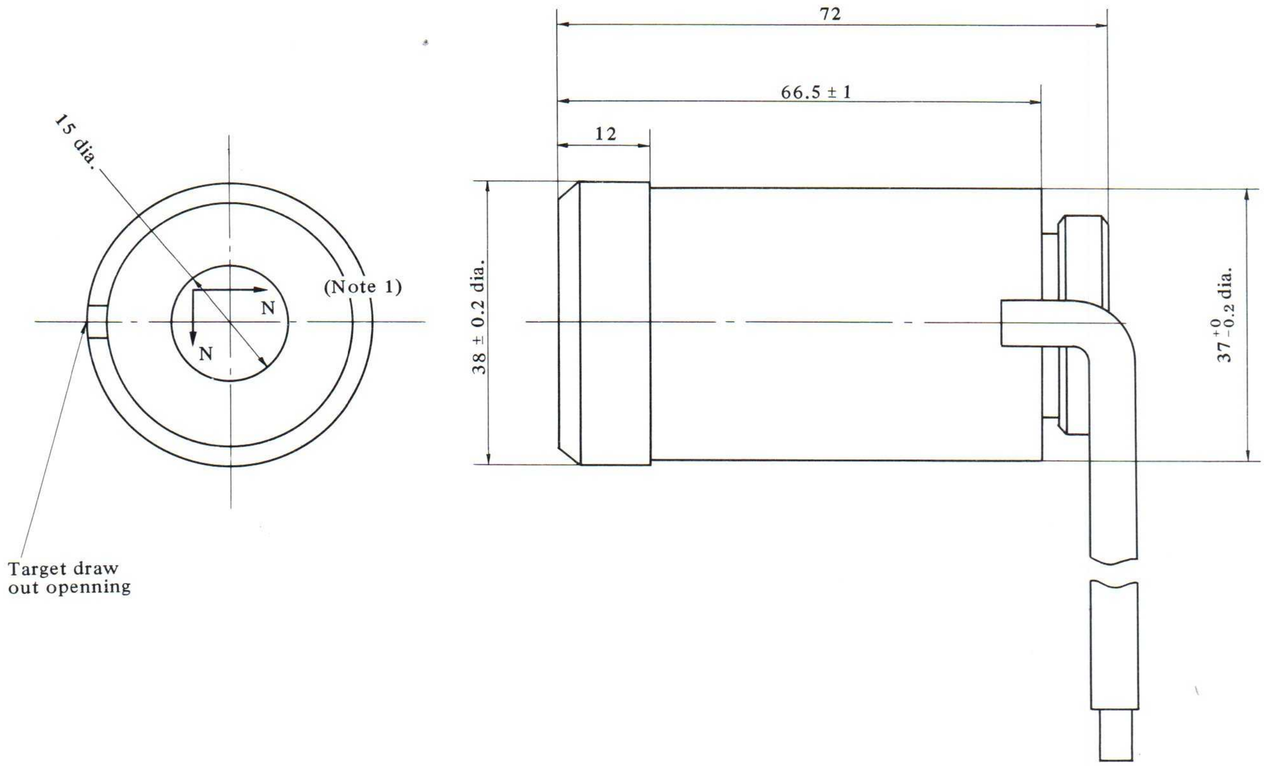
Note:

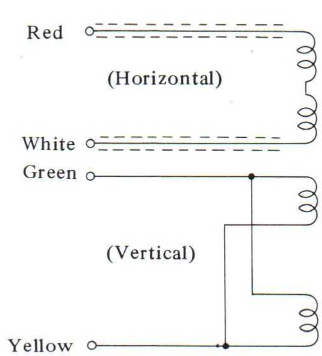
1. N pole is shown, when positive voltage is applied to the red and green leads of horizontal and vertical deflection coils, respectively.
2. The polarity of the focus coil should be such that the north seeking poles is attracted to the image end of the coil.

HITACHI

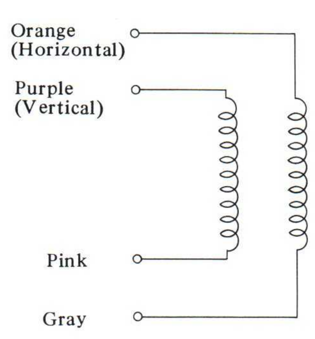
■ OUTLINE

Dimensions in mm

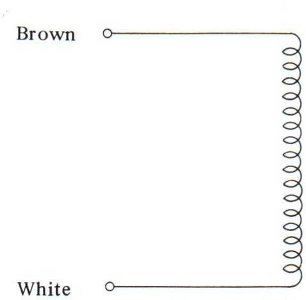




Deflection coils



Alignment coils



Focus coil (Note 2)

HITACHI SATICON YOKE ASSEMBLY SY2052

■ FEATURES
- Small sized and light weight.
- For industrial use.

■ APPLICATION
- 2/3-inch SATICON H9313.

■ GENERAL DATA

Deflecting method	Magnetic
Focussing method	Electrostatic
Greatest diameter	30 ± 0.2 mm
Overall length (approx.)	88 mm
Weight (approx.)	60 g

■ ELECTRICAL DATA

	Inductance (mH)	Resistance (ohm)
Vertical deflection coil	10	100
Horizontal deflection coil	0.8	5.0

■ REQUIRED CURRENTS FOR TYPICAL OPERATION

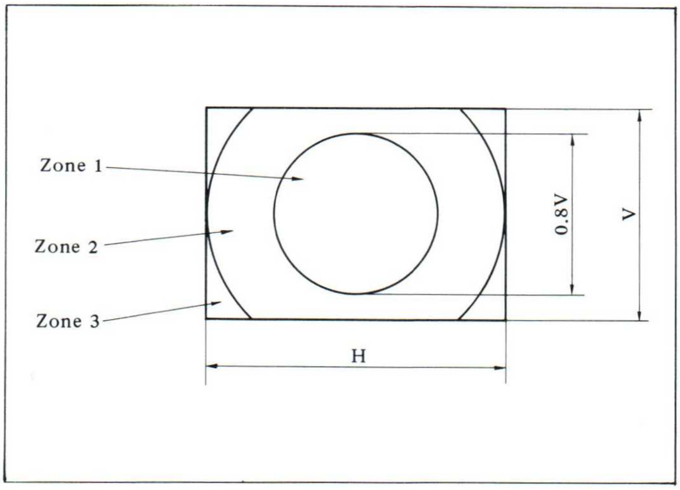
(Grid No. 2+5 voltage 300 V, Grid No. 3+6 voltage 500 V, measured with the H9313)

Vertical deflection coil (approx.)	16 mAp-p
Horizontal deflection coil (approx.)	120 mAp-p
Alignment Magnet	
Field strength	0~4G

■ MISREGISTRATION

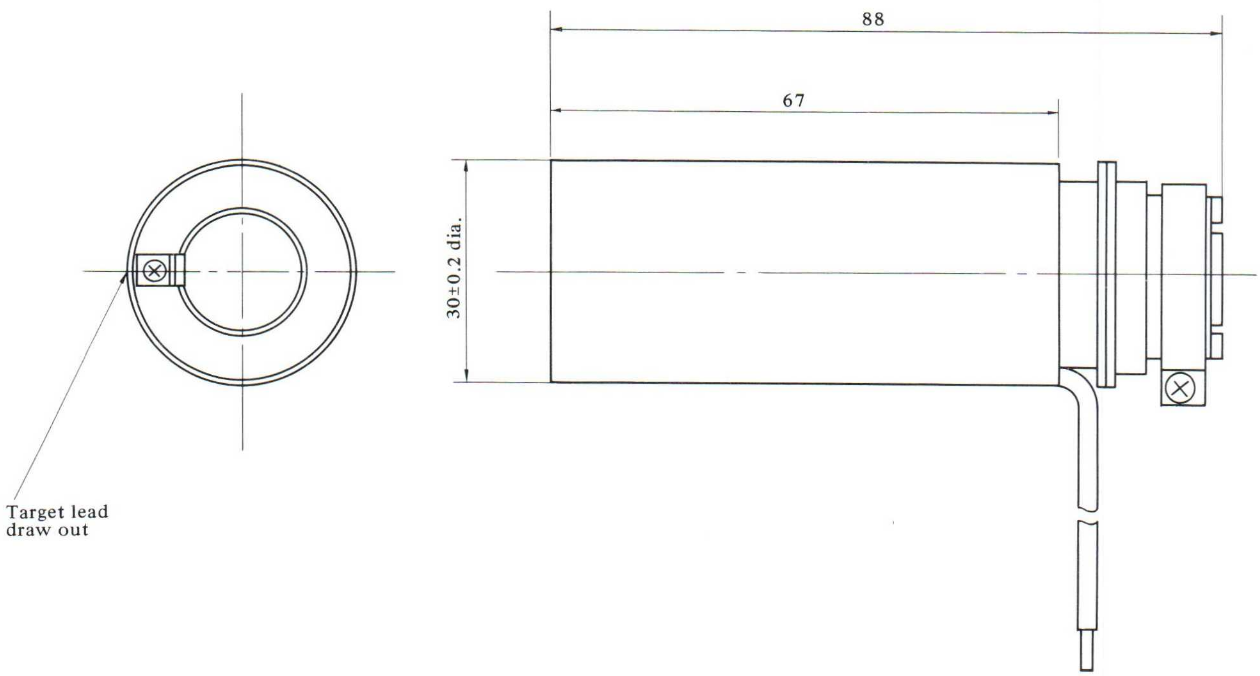
Zone 1	less than 0.2% of picture height
Zone 2	less than 0.4% of picture height
Zone 3	less than 0.8% of picture height

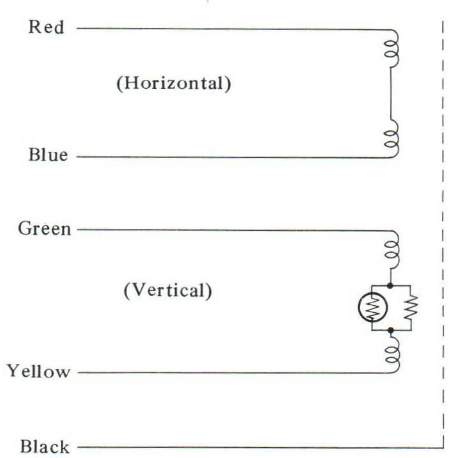
Zones are shown as below.



■ OUTLINE

Dimensions in mm





Deflection coils

■ FEATURES

- Rear loading.
- Complated magnetic shield.
- Very small misregistration.
- Bias light source and first stage of preamplifier can be mounted.

■ APPLICATION

- 1-inch SATICON H8362A.

■ GENERAL DATA

Deflecting method	Magnetic
Focussing method	Magnetic
Diameter	
Maximum	68.0 ± 0.2 mm
Shielding case	66.0 ± 0.2 mm
Overall length (approx.)	150 mm
Weight (approx.)	1,200 g

■ ELECTRICAL DATA

	Inductance (mH)	Resistance (ohm)
Vertical deflection coil	60	171
Horizontal deflection coil	1.4	2.5
Alignment coil	–	140
Focus coil	–	127

■ REQUIRED CURRENTS FOR TYPICAL OPERATION

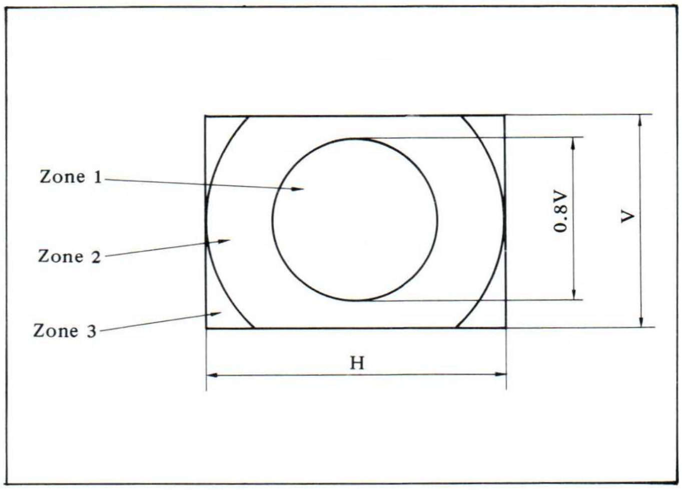
(Grid No. 3 voltage 720 V, Grid No. 4 voltage 900 V, measured with the H8362A)

Vertical deflection coil (approx.)	48 mAp-p
Horizontal deflection coil (approx.)	380 mAp-p
Alignment coils	
Current	35 mA DC
Field strength	4G
Focus coil	
Current	100 mA DC
Field strength	68G

■ MISREGISTRATION

Zone 1	less than 0.05% of picture height
Zone 2	less than 0.2% of picture height
Zone 3	less than 0.3% of picture height

Zones are shown as below.

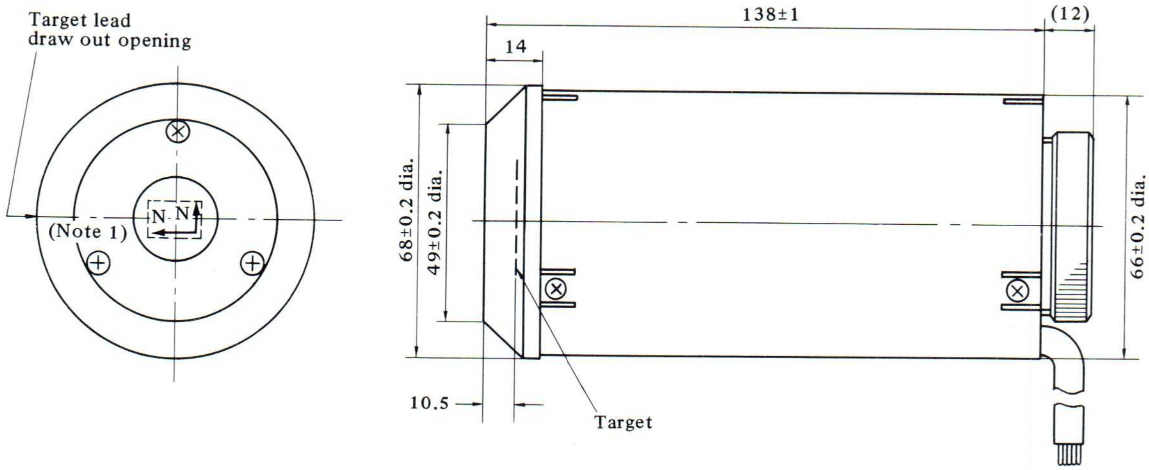


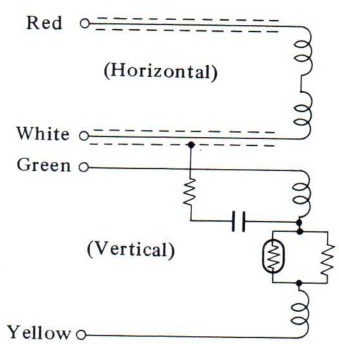
Note:

1. N pole is shown, when positive voltage is applied to the red and green leads of horizontal and vertical deflection coils, respectively.
2. The polarity of the focus coil should be such that north seeking pole is attracted to the image end of the coil.

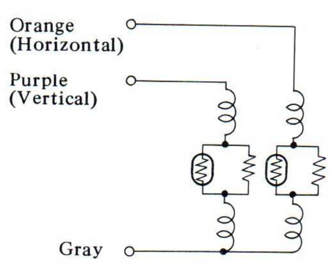
■ OUTLINE

Dimensions in mm

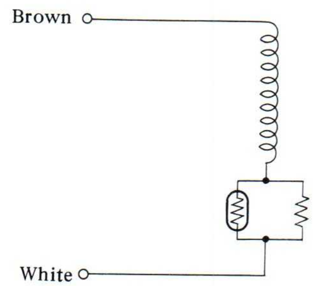




Deflection coils



Alignment coils



Focus coil (Note 2)

■ FEATURES

- Front loading.
- Completed magnetic shield.
- Very small misregistration.
- Bias light source and first stage of preamplifier can be mounted.

■ APPLICATION

- 1-inch SATICON H9326.

■ GENERAL DATA

Deflecting method	Magnetic
Focussing method	Magnetic
Greatest diameter	$54.5^{\ 0}_{-0.2}$ mm
Overall length (approx.)	144 mm
Weitht (approx.)	750 g

■ ELECTRICAL DATA

	Inductance (mH)	Resistance (ohm)
Vertical deflection coil	20	65
Horizontal deflection coil	1.6	3.8
Alignment coil	—	385
Focus coil	—	110

■ REQUIRED CURRENTS FOR TYPICAL OPERATION

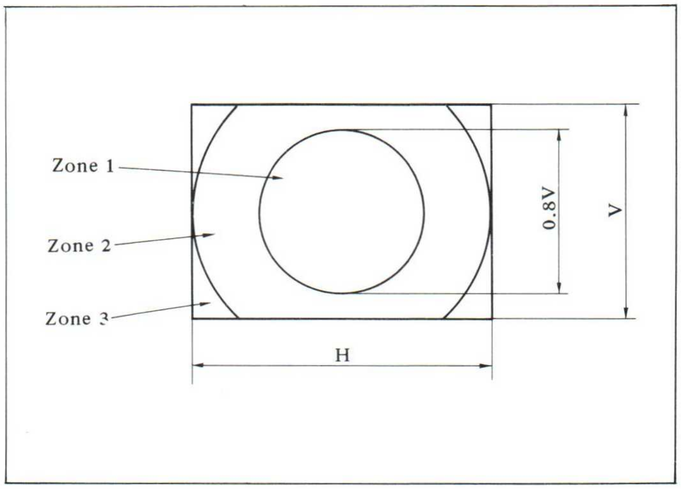
(Grid No. 3 voltage 630 V, Grid No. 4 voltage 900 V, measured with the H9326)

Vertical deflection coil (approx.)	38 mAp-p
Horizontal deflection coil (approx.)	250 mAp-p
Alignment coils	
Current	30 mA DC
Field strength	4G
Focus coil	
Current	120 mA DC
Field strength	64G

■ MISREGISTRATION

Zone 1	less than 0.05% of picture height
Zone 2	less than 0.2% of picture height
Zone 3	less than 0.3% of picture height

Zones are shown as below.

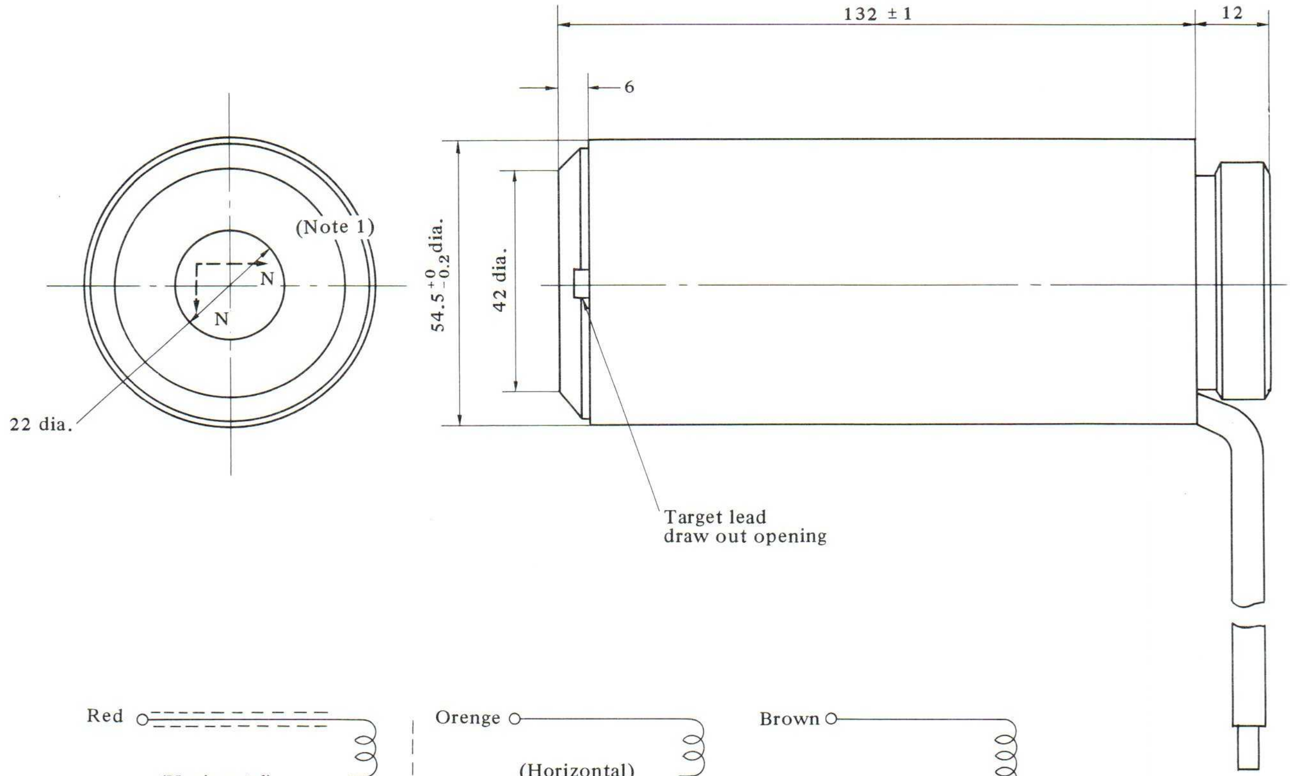


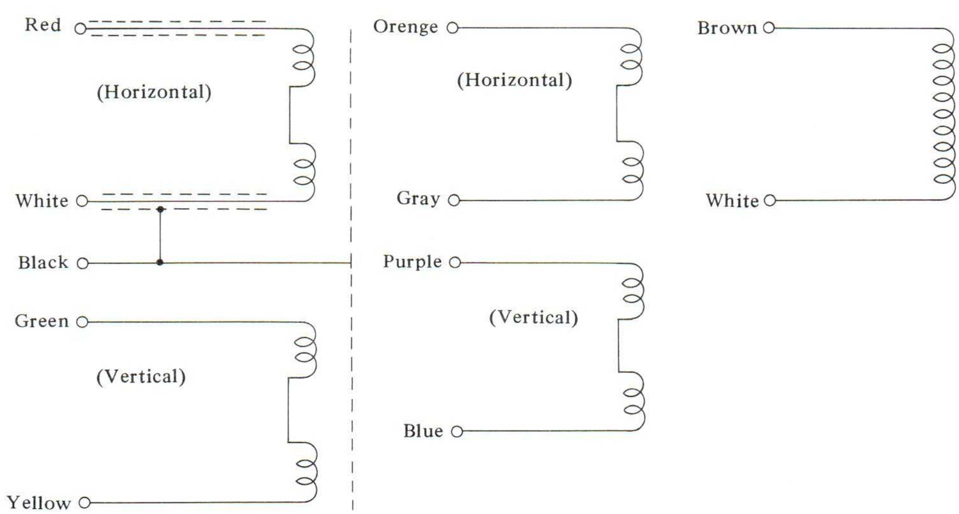
Note:

1. N pole is shown, when positive voltage is applied to the red and green leads of horizontal and vertical deflection coils, respectively.
2. The polarity of the focus coil should be such that the north seeking pole is attracted to the image end of the coil.

■ OUTLINE

Dimensions in mm





Deflection coils

Alignment coils

Focus coil (Note 2)

MEMO

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Arlington Heights, Illinois
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(HITACHY ARHT)

DÜSSELDORF
Hitachi Electronic Components
Europe GmbH
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LONDON
Hitachi Electronic Components
(U.K.) Ltd.
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Southall, Middlesex UB2 5LF
Telephone: 01-574-0732/8
Telex: 936293
(HITELECTRO HYES)

March/1979 Catalog No. CE-E477 Printed in Japan NK-M(H)

HITACHI SATICON* H8362A

HITACHI

* Trade mark

This data sheet is a revised edition of catalog No. CE-E407P.

- **1-inch diameter**
- **Employing SATICON target**
- **Employing Low-Lag Gun**
- **Magnetic focus, magnetic deflection**
- **For telecine color TV cameras in broadcast applications**

The H8362A is a high-performance vidicon type TV pickup tube employing Low-Lag Gun and magnetic focus and magnetic deflection. The H8362A employs the SATICON target which is a special photoconductive film of Se-As-Te chalcogenide glass for its photoconductive layer. It features high sensitivity, excellent resolution, color reproducibility, and flare characteristics. Thus, it largely contributes to telecine color TV cameras.

FEATURES

1. **Low Lag**
   With newly developed Low–Lag Gun, it features excellent lag characteristic, same lag value can be attained with halved bias-light quantity compared to the former version.

2. **High resolution**
   Compared with conventional telecine color TV camera which employs antimony trisulfide photoconductor vidicon, high resolution can be obtained in a camera using H8362A, because of it's low lag and negligible flare in addition to high resolution.

3. **Good color reproduction**
   Good color reproduction will be obtained under the condition of wide scene illumination because of it's possibility linear color encoding in the color encode matrix circuits. This feature is produced by such the characteristics as nearly unity gamma, very low dark current and negligible flare.

4. **Minimum shading correction**
   Shading correction value is much smaller than a conventional camera which employs vidicons, because of its good signal uniformity.
   Shading correction should be applied to only shading caused by a optical system.

5. **High sensitivity**
   In a practical operation it can be obtained over 10 times higher sensitivity than that of a camera using vidicon. Especially, in a opaque camera operation, its sensitivity has a enough surplus. That is, the camera which employs H8362A can be operated with lens iris F 8 to ensure enough optical focal depth.

6. **Stable registration**
   The misregistration value of three channels in any set is never greater than 0.3% of the picture height at the corners of the picture. These value will be obtained with easy and quick adjustment because of employing high precised electrode holding structure and high precisely formed glass bulb.

Note: The information contained herein is tentative and may be changed without prior notice. It is therefore advisable to contact Hitachi before proceeding with the design of equipment incorporating this product.

<Sept./1978>

GENERAL DATA

Heater voltage . . . . 6.3V ± 10%
Heater current . . . . 0.095 A
Direct interelectrode capacitance
  Target to all other electrodes (Note 1) . . . . 4.6 pF
Spectral sensitivity characteristic . . . . See Fig. 2
Focusing method . . . . Magnetic
Deflection method . . . . Magnetic
Overall length . . . . 159 ± 3 mm
Greatest diameter . . . . $28.6\phi \pm 0.3$ mm
Operating position . . . . Any

MAXIMUM RATINGS
(Absolute maximum values) (Note 2)

For scanned area of 9.5 mm x 12.7 mm
Grid No. 4 voltage . . . . 1,500 V
Grid No. 3 voltage . . . . 1,000 V
Grid No. 2 voltage . . . . 750 V
Grid No. 1 voltage . . . .
  Negative bias value . . . . 300 V
  Positive bias value . . . . 0 V
Peak heater—cathode voltage:
  Heater negative with respect to cathode . . . . 125 V
  Heater positive with respect to cathode . . . . 10 V
Target voltage (signal electrode) . . . . 80 V
Faceplate temperature . . . . 50°C

TYPICAL OPERATION (Note 3)

For scanned area of 9.5 mm x 12.7 mm
Faceplate temperature . . . . 25 ~ 35°C
Grid No. 4 voltage . . . . 900 V
Grid No. 3 voltage . . . . 720 V
Grid No. 2 voltage . . . . 300 V
Grid No. 1 voltage for picture cutoff . . . . . −45 ~ −100 V
Gamma 1
Minimum peak-to-peak blanking voltage:
  when applied to grid No. 1 . . . . 75 Vp-p
  when applied to cathode . . . . 20 Vp-p
Field strength at center of focusing coil . . . . 52 G
Field strength of adjustable alignment coil . . . . 0 ~ 4 G
Average sensitivity operation
  Faceplate illumination 10 1x
  Target voltage (Note 4) . . . . 50 V
  Dark current . . . . 0.5 nA
Sensitivity (2,854°K tungsten illumination on tube face)
  (Note 6, Note 7) . . . . W 350 μA/lm
R 120 μA/lm
G 150 μA/lm
B 80 μA/lm
Lag (Note 5) . . . . Less than 2%
  (With applying bias light equivalent 10 nA signal current)
Amplitude response . . . . See Fig. 1
Spectral sensitivity characteristic . . . . See Fig. 2
Light transfer characteristic . . . . See Fig. 3
Typical persistence characteristics . . . . See Fig. 4
Spectral reflectivity . . . . See Fig. 5

Note

1. This value is an effective output impedance, which increases when a tube is inserted in the yoke assembly.
2. The maximum ratings in the table are established in accordance with the following definition of the absolute maximum rating system for rating electron devices.
   Absolute maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data and should not be exceeded under the worst conditions.
   The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations and the effects of changes in operating conditions due to variations in device characteristics.
   The equipment manufacturer should design so that initially and throughout life no absolute maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variations, equipment component variation, equipment control adjustment, load variation, environmental conditions, and variations in device characteristics.
3. For yoke assembly, use a Hitachi SATICON yoke assembly SY2501 or its equivlent.
4. Set the target voltage precisely at 50V. Lower voltage will cause deterioration of photoconductor performance, and higher voltage will reduce the service life. The target voltage and current characteristic represent their saturation characteristics. Accordingly, automatic sensitivity adjustment by varying the target voltage is impossible.
5. The lag is the percent of initial value of signal output current 1/20 seconds after illumination is removed, when the signal current is set at 0.4 μAp-p, and the beam current at 0.6 μAp-p.
6. The sensitivity is a value obtained by measuring a signal current for faceplate illumination of 10 lx by employing a light source at 2,856°K color temperature and dividing the signal current by incident light flux.
   In the case of color sensitivity, the filters listed below are employed respectively, and the color sensitivity expressed in terms of μA/1 m of white light before the filter.
   R : FC-HS R1 filter
   G : FC-HS G1 filter
   B : FC-HS B1 filter
7. Spectral transmission factors of the filters are shown in Fig. 6. FC-HS filters are designed of which transmission factor resemble to that of FUJINON TVC-665 or TVC-555 series optical system.

FUJI PHOTO OPTICAL CO., LTD.
No. 324 1-chome Uetake-machi,
Omiya, Saitama Pref.
JAPAN
Tel. : (0486) 63-0111
Telex : J22885

Scanned area: 9.5 mm x 12.7mm
Grid No. 4 voltage: 900V
Grid No. 3 voltage: 720V
Signal current: 0.4μ Ap-p
Beam current: 0.6μ Ap-p
Target voltage: 50V
Test chart: EIAJ B_2

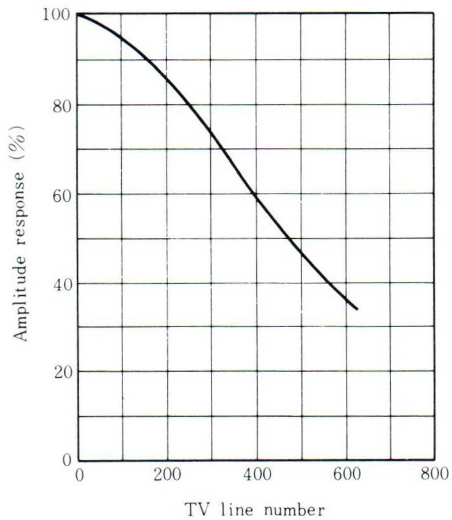


Fig. 1. Amplitude response

Scanned area: 9.5 mm x 12.7 mm
Faceplate temperature: 30°C (Approx.)
Target voltage: 50V

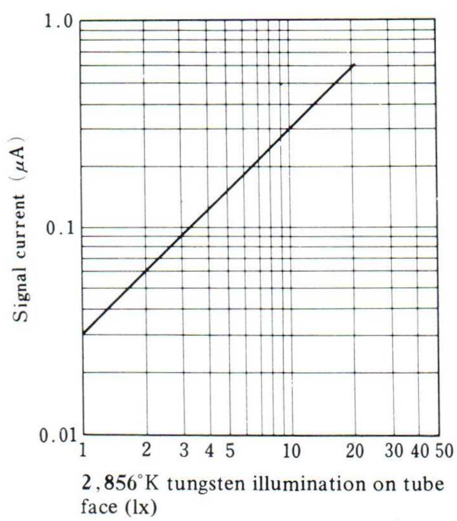


Fig. 3. Light transfer characteristic

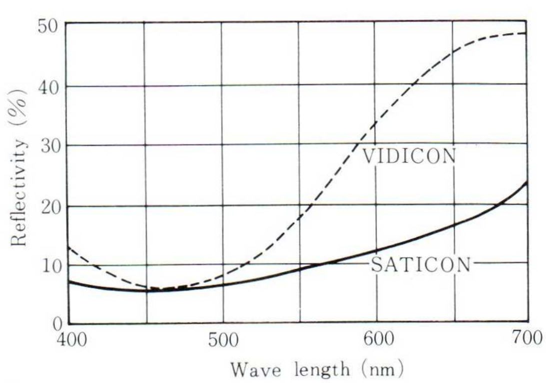


Fig. 5. Spectral reflectivity

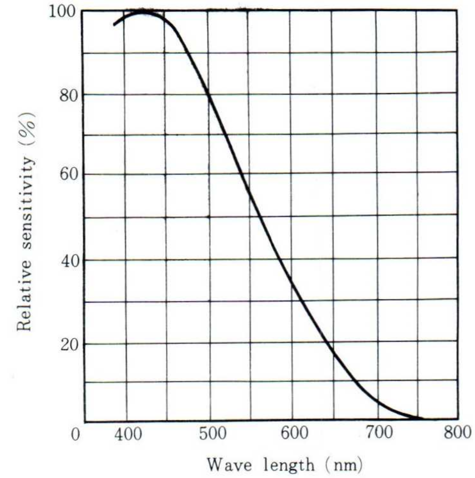


Fig. 2. Spectral sensitivity characteristic

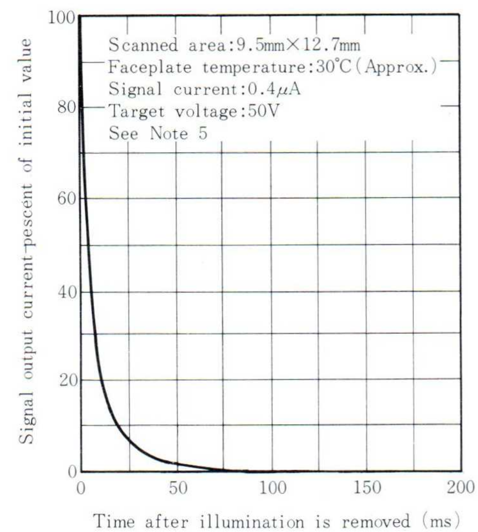


Fig. 4. Typical persistence characteristic

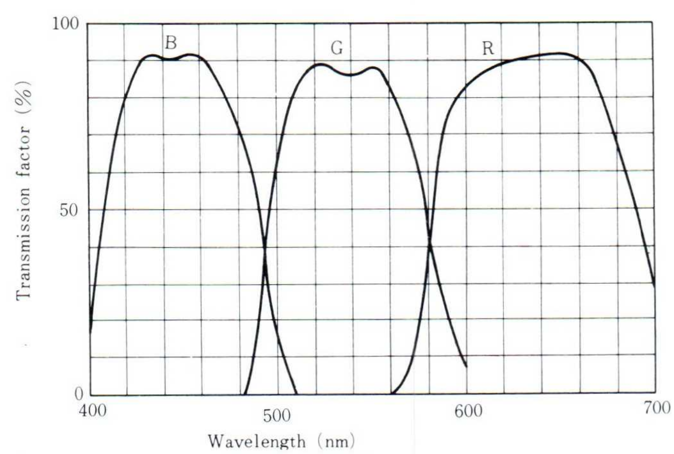
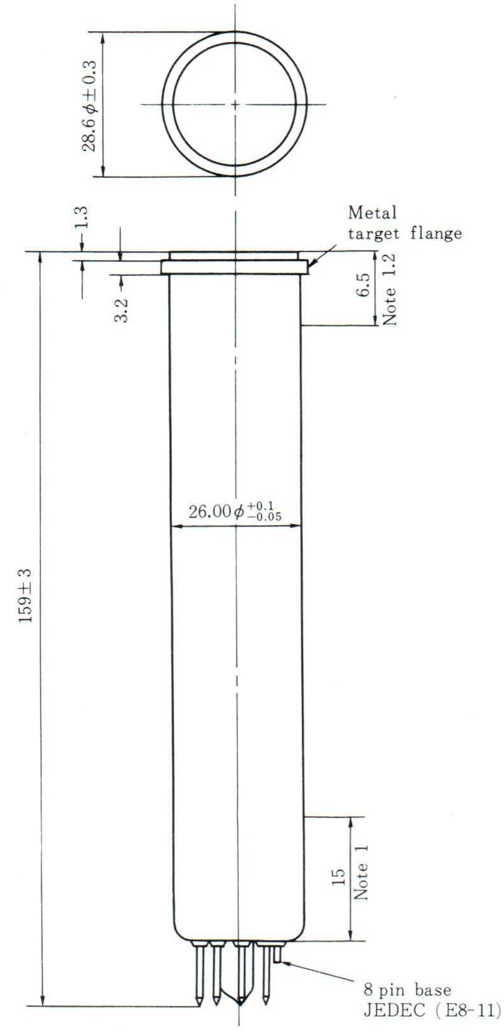
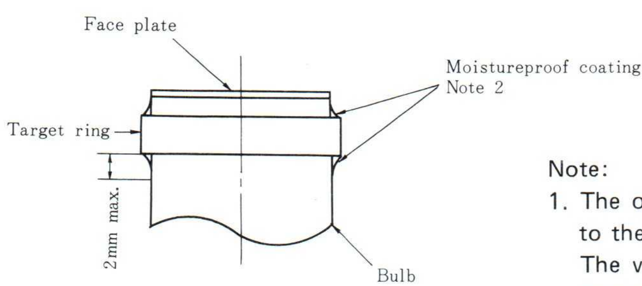


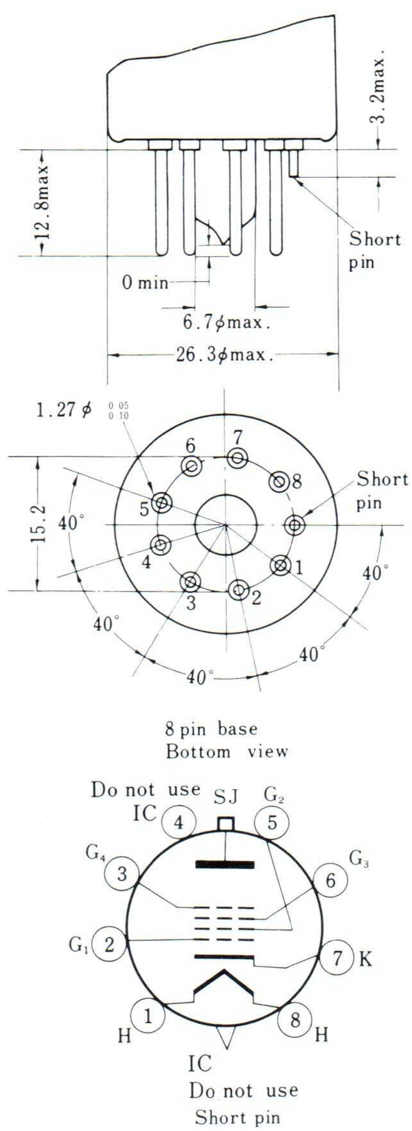
Fig. 6 Spectral transmittance of filters

DIMENSIONAL OUTLINE AND BASE CONNECTION

Dimensions in mm







Note:

1. The outside diameter value $26.00^{+0.1}_{-0.05}$mm shall not apply to the target-side 6.5 mm and the stem-side 15 mm section. The value for the stem-side 15 mm section shall be 26.1φ mm max.. Regarding the target side, refer to Note 2 below.
2. The target section shall be coated with a moistureproof coating as shown in the diagram.

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(HITELECTRO HYES)

Catalog No. CE-E407Q Printed in Japan NY-T(H)

HITACHI SATICON*
H8397A

HITACHI

* Trade mark

- 2/3-inch diameter
- Employing SATICON target
- Remarkable low lag characteristic
- Magnetic focus, magnetic deflection
- For high quality small sized color TV cameras and studio use in broadcast applications

The H8397A is an improved type of the high performance SATICON H8397 in its lag characteristic. The H8397A employs the SATICON target (Se-As-Te chalcogenide glass photoconductive layer) and a newly designed superior gun electrode. As the result of this improvement, lag is reduced to almost half that of the H8397. The H8397A requires 5nA equivalent bias light signal current.
The H8397A also features excellent resolution, color reproducibility, and flare characteristics. Thus, it largely contributes to miniaturization and weight reduction of live color TV cameras for versatile operation.

FEATURES

1. High resolution
Because of its high resolving power, the amplitude modulation at center of the picture is about 45% at 400TV lines, and 60% at 320TV lines and almost no changes with beam current.

2. Wide spectral response and high sensitivity
The well-balanced spectral sensitivity characteristic renders it ideally adaptable to color TV cameras. It has no sensitivity in the infrared region, and a high sensitivity for the blue light. No red, green and blue tube selection required.
Signal current for 2,000 lx scene illumination of 3,200°K obtains 160nA, 200nA and 100nA for red, green and blue channels respectively for lens iris f:4 with using a suitable optical system of FUJINON TVC-665 or TVC-555.

3. Low lag
The lag is enough low for the practical operation with a bias light of equivalent 5nA signal current.

4. Negligible flare
The flare phenomenon is not disturbing owing to the slight reflection coefficient of the photoconductor throughout the entire region of visible light; consequently, application of a flare tip and a flare compensation circuit is unnecessary.

5. Low dark current
Dark current, at a target voltage of 50V, is 0.3nA.

6. Gamma
The gamma value is about unity. Therefore a good contrast video picture is obtainable.

Note: The information contained herein is tentative and may be changed without prior notice. It is therefore advisable to contact Hitachi before proceeding with the design of equipment incorporating this product.

Feb./1977

GENERAL DATA

Heater voltage	6.3V ± 10%
Heater current	0.095A
Direct interelectrode capacitance:	
Target (signal electrode) to all other electrodes (Note 1)	3.5 pF
Optical:	
Maximum useful scanned area	6.6 mm x 8.8 mm
Tube orientation	Horizontal scan is essentially parallel to the plane passing through the tube axis and short pin.
Thickness of faceplate	1.5 ± 0.2 mm
Reflective index of faceplate	1.505
Grid No. 1 voltage for picture cutoff	−80 ~ −130 V
Minimum peak to peak blanking voltage:	
when applied to grid No. 1	50 Vp-p
when applied to cathode	20 Vp-p
Focusing method	Magnetic
Deflection method	Magnetic
Overall length	105 mm
Greatest diameter	19.6 ± 0.2 mm
Operating position	Any

MAXIMUM RATINGS (Absolute maximum values Note 2)

For scanned area of 6.6 mm x 8.8 mm

Grid No. 4 voltage	750 V
Grid No. 3 voltage	750 V
Grid No. 2 voltage	350 V
Grid No. 1 voltage:	
Negative bias value	300 V
Positive bias value	0 V
Peak heater-cathode voltage:	
Heater negative with respect to cathode	125 V
Heater positive with respect to cathode	10 V
Target voltage	80 V
Faceplate:	
Illumination	500 lx
Temperature	50°C

TYPICAL OPERATION (Note 3)

For scanned area of 6.6 mm x 8.8 mm

Faceplate temperature . . . . 25 ~ 35°C

	Low voltage operation	High voltage operation
Grid No. 4 voltage (Note 4)	425	700 V
Grid No. 3 voltage (Note 4)	290	475 V
Grid No. 2 voltage	300	300 V
Grid No. 1 voltage (Note 5)	Adjust	Adjust
Target voltage (Note 6)	50	50 V
Dark current	0.3	0.3 nA

Sensitivity (2,854°K tungsten illumination on tube face)

(Note 7, Note 8)	W 350μA/lm
	R 120μA/lm
	G 150μA/lm
	B 80μA/lm

Spectral sensitivity characteristic	See Fig. 3
Light transfer characteristic	See Fig. 4
Gamma	1
Lag (Note 9)	1.5%
(With applying bias light equivalent 5nA signal current.)	
Amplitude response	See Fig. 1, Fig. 2
Spectral reflectivity	See Fig. 5

Note

1. This value is an effective output impedance, which increases when a tube is inserted in the yoke assembly.
2. The maximum ratings in the table are established in accordance with the following definition of the absolute maximum rating system for rating electron devices. Absolute maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data and should not be exceeded under the worst conditions.
   The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations and the effects of changes in operating conditions due to variations in device characteristics.
   The equipment manufacturer should design so that initially and throughout life no absolute maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variations, equipment component variation, equipment control adjustment, load variation, environmental conditions, and variations in device characteristics.
3. For Yoke assembly, use a Hitachi SATICON yoke assembly H9325 or its equivalent.
4. Grid No. 4 voltage must always be greater than Grid No. 3 voltage. The optimum ratio of Grid No. 3 to Grid No. 4 voltage depends on the yoke assembly used. This ratio should be adjusted for optimum performance with regard to signal uniformity and geometrical accuracy.
   This value was actually measured with a HITACHI YOKE ASSEMBLY H9325 or its equivalent. In this case, the recommended ratio of Grid No. 3 to Grid No. 4 voltage is 0.68.
5. Adjust the grid No. 1 voltage so that beam current reaches the rated value.
6. Set the target voltage precisely at 50V. Lower voltage will cause deterioration of photoconductor performance, and higher voltage will reduce the service life. The target voltage and current characteristic represent their saturation characteristics.
   Accordingly, automatic sensitivity adjustment by varying the target voltage is impossible.
7. The sensitivity is a value obtained by measuring a signal current for faceplate illumination of 10 lx by employing a light source at 2,854°K color temperature and dividing the signal current by incident light flux.
   In the case of color sensitivity, the filters listed below are employed respectively, and the color sensitivity ex-

SPURIOUS SIGNAL

Spurious signal test:

This test is performed a uniformly diffused white test pattern that is separated into three zones shown in Fig. 1.

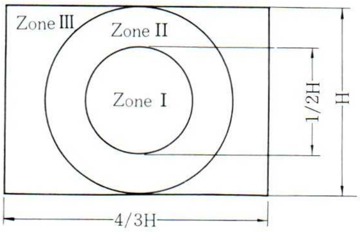


Fig. 1

Spurious signals are evaluated by maximum number of spots and Maximum Spot Nuisance Value.

Spot Nuisance Value = Size (percent of picture height) x Contrast (modulation depth)

Definition of blemishes:

Blemishes can be regarded as either spots and smudges which are small areas of uneven modulation of any signal current between black level and white level.

A spot is defined as a blemish with a maximum linear dimension in any direction of 0.8% the picture height and a contrast in excess of 10% of 100% white level (signal current is 0.2μAp-p), as measured on a waveform oscilloscope (bandwidth 5MHz), black level being defined as 0%.

Table 1 For scanned area of 8.8 mm x 6.6 mm

Spot size (raster lines) (% of picture height)	Zone I	Zone II	Zone III	Total number of spots
Over 4 ($>$0.8)	0	0	0	0
4 (= 0.8)	0	0	1	1
3 but not including 1 ($\leqq$0.6 but $>$0.2)	0	1	2	2
1 or less ($\leqq$0.2)	*	*	*	*
Spot Nuisance Value	0	20	40	50

1) * Spots of this size are allowed unless concentration causes a smudged appearance.
2) Blemishes with contrast $\leqq$ 10% are not counted.
3) Minimum separation between 2 spots greater than 1 raster line is limited to 16 raster lines.

TESTS SPECIFICATION

Testing conditions: (Note 1, 2)

Heater voltage . . . . 6.3 V
Target voltage . . . . 50 V
Grid voltage
  Grid No. 4 . . . . 425 V
  Grid No. 3 . . . . Adjust
  Grid No. 2 . . . . 300 V
  Grid No. 1 . . . . Adjust
Field strength at center of focusing coil 55G
Faceplate illumination . . . . Adjust
Faceplate temperature . . . . 25 to 35°C
Signal current 0.2μAp-p
Beam current 0.4μAp-p
Scanned area . . . . 6.6 mm x 8.8 mm

Specifications;

	min.	mean	max.
Signal current (Note 3)	0.15	–	–μA
Ampritude response, (Note 4)			
Center of picture	35	45	– %
Corner of picture	20	–	– %
After image (Note 5)	–	–	10 sec
Microphony (Note 6)	–	–	10 sec
Picture cutoff voltage	–130	–	–80 V
Interelectrode capacitance	–	3.5	– pF
Spurious signal	See SPURIOUS SIGNAL		
Geometric distortion (Note 7)	–	–	0.6 %
Lag (Note 8)	–	–	3 %
Heater current	0.085	–	0.105 A
Field strength of adjustable alignment coil	–	–	2 Gauss
Maximum grid No. 2 current (Note 9)	1000	–	– μA
Signal uniformity	–	–	15 %
Dark current	–	–	0.5nA
Inspection on a trio of tubes selected for three tube color TV camera			
Registration (Note 10) Zone I	–	–	0.05 %
Zone II	–	–	0.2 %
Zone III	–	–	0.3 %
Difference of signal uniformity	–	–	5 %
Difference of gamma	–	–	0.03 %

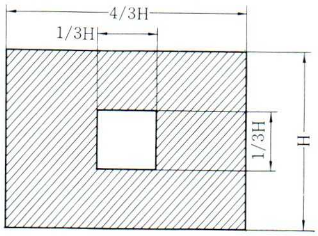


Fig. 2

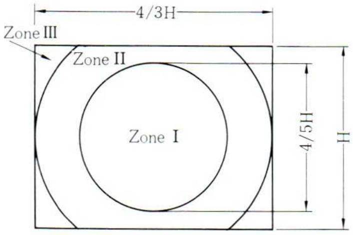
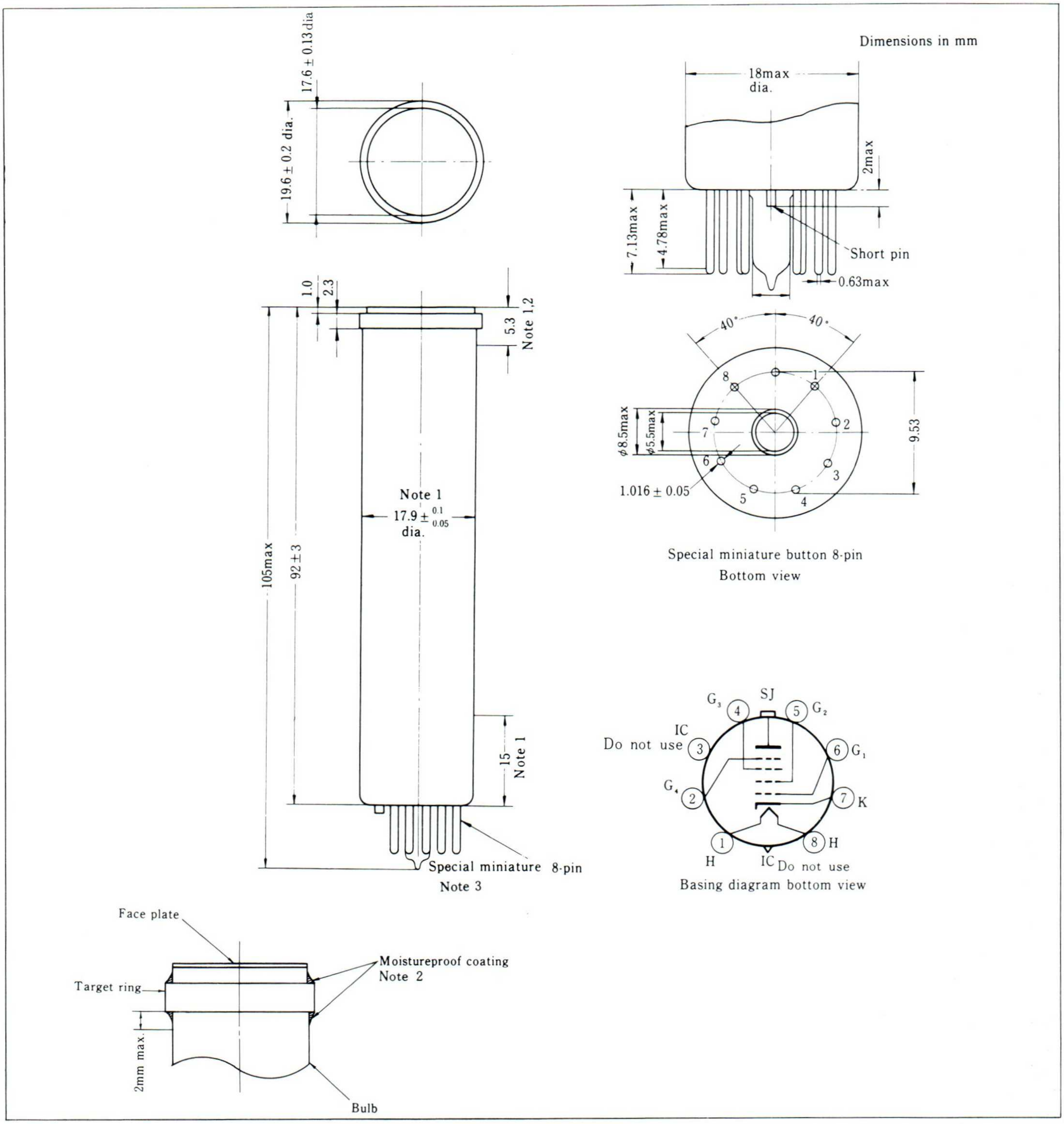


Fig. 3

Note

1. The horizontal scan is essentially parallel to the plane passing through the tube axis and short pin.
2. Yoke assembly : H9325 (Hitachi SATICON yoke assembly)
3. Faceplate illumination = 10 lx
4. At 400 TV lines
5. (1) The tube is focused on a test chart, as shown in Fig. 2, for 30 seconds.
   Then the camera is moved to a uniform light background.
   (2) Measure the time until the after image is disappear.
6. Measure the duration of microphony time when a small mechanical shock is applied to the tube.
7. The cross stripes test chart is used, and its image compared with an electronically generated raster.
   Any distortions are expressed as percent of picture height.
8. 50 milliseconds after illumination is removed with bias-light which is equivalent 5nA signal current.
9. Grid No. 1 voltage = 0
10. The test chart is separated into three zones as shown in Fig. 3.

DIMENSIONAL OUTLINE AND BASE CONNECTION



Note

1. The outside diameter value $17.9 \pm^{0.1}_{0.05}$ mm shall not apply to the target-side 5.3 mm and the stem-side 15 mm section. The value for the stem-side 15 mm section shall be 18.0φmm max.. Regarding the target side, refer to Note 2 below.
2. The target section shall be coated with a moistureproof coating as shown in the diagram left side.
3. Socket for this tube is S8-504B-90 made by CHUO MUSEN CO, LTD., 1-CHOME, OHMORI-NISHI, OHTA-KU, Tokyo.

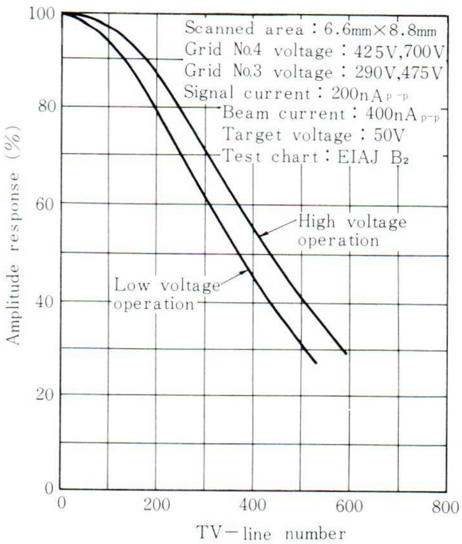


Fig. 1 Amplitude response

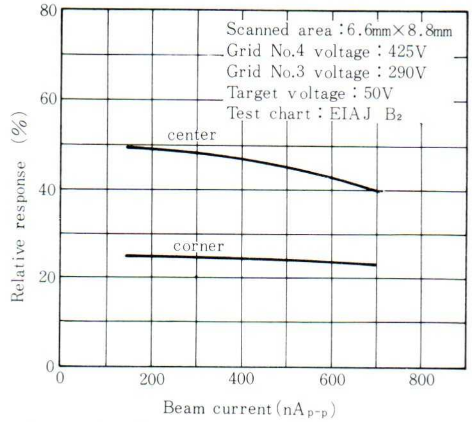


Fig. 2 Relative response—beam current characteristics

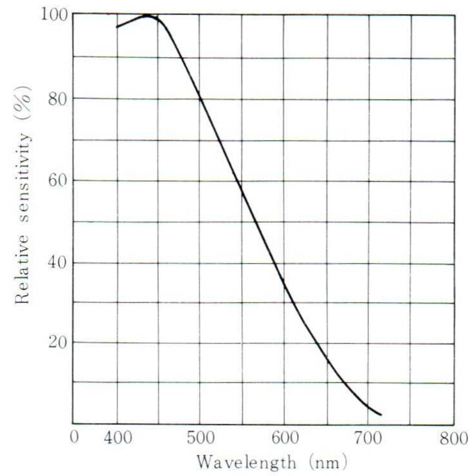


Fig. 3 Spectral sensitivity characteristic

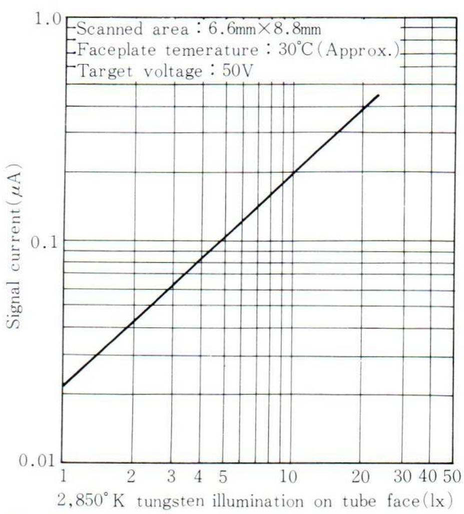


Fig. 4 Light transfer characteristic

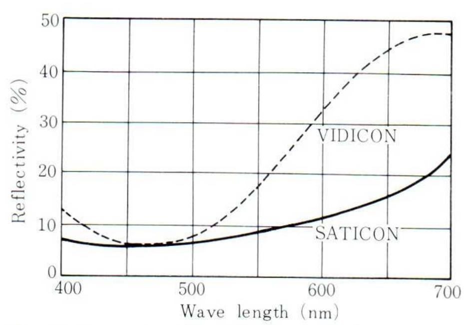


Fig. 5 Spectral reflectivity

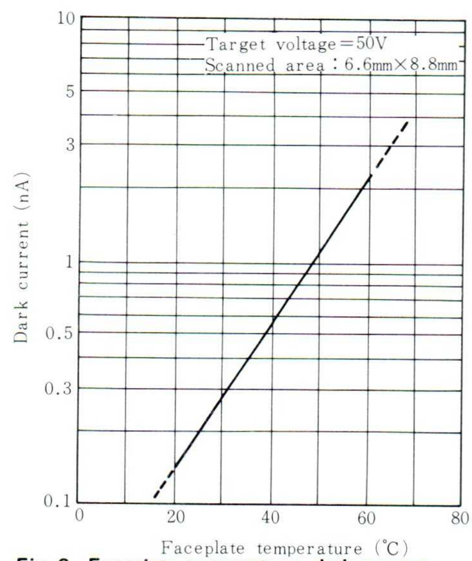


Fig. 6 Faceplate temperature—dark current

pressed in terms of μA/1m of white light before the filter.

R : FC-HS R1 filter
G : FC-HS G1 filter
B : FC-HS B1 filter

8. Spectral transmission factors of the filters are shown in Fig. 7. FC-HS filters are designed of which transmission factor resemble to that of FUJINON TVC-665 or TVC-555 series optical system.

FUJI PHOTO OPTICAL CO., LTD.
No. 324 1-chome Uetake-machi,
Omiya, Saitama Pref.
JAPAN
Tel. : : (0486) 63-0111
Telex : J22885

9. The lag is the percent of initial value of signal output current 1/20 seconds after illumination is removed, when the signal current is set at 0.2μAp-p and the beam current at 0.4μAp-p.

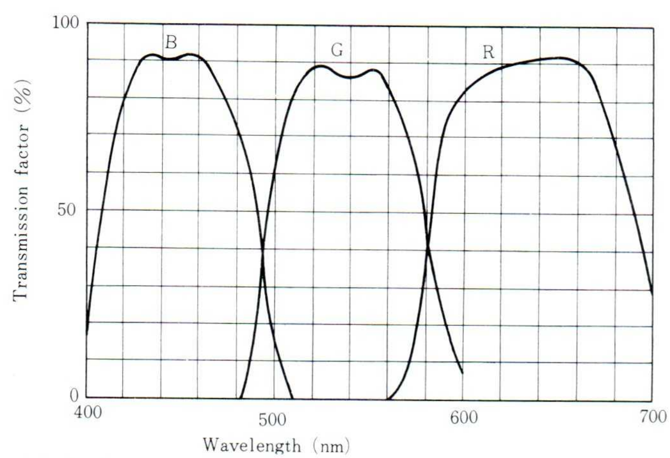


Fig. 7 Spectral transmittance of filters

Hitachi, Ltd.

6-2, Otemachi 2-Chome, Chiyoda-ku
Tokyo 100
Telephone: Tokyo (270) 2111
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Europe GmbH
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LONDON
Hitachi Electronic Components
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Hitachi House, Station Road
Hayes, Middlesex UB3 4DR
Telephone: (848) 8787
Telex: 936293
(HITELECTRO HYES)

Catalog No. CE-E406 Printed in Japan NY-F(H)

HITACHI SATICON*
H9311A

HITACHI

*Trade mark

- 2/3-inch diameter
- Employing SATICON target
- Remarkable low lag characteristic
- Magnetic focus, magnetic deflection
- For hand-held color TV cameras in educational, medical and high quality industrial applications

The H9311A is an improved type of the high performance SATICON H9311 in its lag characteristics. The H9311A employs the SATICON target (Se-As-Te chalcogenide glass photoconductive layer) and a newly designed superior gun electrode. As the result of this improvement, lag is reduced to almost half that of the H9311. The H9311A requires 5nA equivalent bias light signal current. Thus, it largely contributes to miniaturization and weight reduction or live color TV cameras, hand-held color camera for versatile operation, in educational, medical and high quality industrial applications.

FEATURES

1. **SATICON target**
   Special photoconductive film of Se-As-Te chalcogenide glass is adopted for the photoconductive layer.

2. **High resolution**
   Because of its high resolving power, the amplitude modulation at center of the picture is about 35% at 400TV lines, and 50% at 320TV lines and slightly changes with beam current.

3. **Wide spectral response**
   The well-balanced spectral sensitivity characteristic renders it ideally adaptable to color TV cameras. It has no sensitivity in the infrared region, and a high sensitivity for the blue light. No red, green and blue tube selection required.

4. **Negligible flare**
   The flare phenomenon is not disturbing owing to the slight reflection coefficient of the photoconductor throughout the entire region of visible light; consequently, application of a flare tip and a flare compensation circuit is unnecessary.

5. **Low lag**
   The lag is enough low for the practical operation with a bias light of equivalent 5nA signal current.

6. **Low dark current**
   Dark current, at a target voltage of 50V, is 0.3nA.

7. **Gamma**
   The gamma value is about unity. Therefore a good contrast video picture is obtainable.

Note: The information contained herein is tentative and may be changed without prior notice. It is therefore advisable to contact Hitachi before proceeding with the design of equipment incorporating this product.

Oct./1978

GENERAL DATA

Heater voltage . . . . 6.3V ± 10%
Heater current 0.095A
Direct interelectrode capacitance:
  Target (signal electrode) to all other electrodes (Note 1) . . . . 3.5 pF
Optical:
  Maximum useful scanned area . . . . 6.6 mm x 8.8 mm
  Tube orientation . . . . Horizontal scan is essentially parallel to the plane passing through the tube axis and No. 4 pin.
  Thickness of faceplate . . . . 1.5 ± 0.2 mm
  Reflective index of faceplate 1.505
Grid No. 1 voltage for picture cutoff . . . . −40 ~ −100V
Minimum peak to peak blanking voltage:
  when applied to grid No. 1 . . . . 75 Vp-p
  when applied to cathode . . . . 20 Vp-p
Focusing method . . . . Magnetic
Deflection method . . . . Magnetic
Overall length . . . . 103 mm max.
Greatest diameter . . . . 19.6 ± 0.2 mm
Operating position . . . . Any

MAXIMUM RATINGS (Absolute maximum values Note 2)

For scanned area of 6.6 mm x 8.8 mm
Grid No. 4 voltage . . . . 750 V
Grid No. 3 voltage . . . . 750 V
Grid No. 2 voltage . . . . 350 V
Grid No. 1 voltage:
  Negative bias value . . . . 300 V
  Positive bias value . . . . 0 V
Peak heater-cathode voltage:
  Heater negative with respect to cathode . . . . 125 V
  Heater positive with respect to cathode . . . . 10 V
Target voltage . . . . 80 V
Faceplate:
  Illumination . . . . 500 lx
  Temperature . . . . 50°C

TYPICAL OPERATION (Note 3)

For scanned area of 6.6 mm x 8.8 mm
Faceplate temperature . . . . 25 ~ 35°C
Grid No. 4 voltage (Note 4) . . . . 400 V
Grid No. 3 voltage (Note 4) . . . . 300 V
Grid No. 2 voltage . . . . 300 V
Grid No. 1 voltage (Note 5) . . . . Adjust
Target voltage (Note 6) . . . . 50 V
Dark current 0.3nA
Sensitivity (2,854°K tungsten illumination on tube face)
  (Note7, Note 8) . . . . W 350 μA/1m
  R 120 μA/1m
  G 150 μA/1m
  B 80 μA/1m
Spectral sensitivity characteristic . . . . See Fig. 2
Light transfer characteristic . . . . See Fig. 3
Gamma (Approx.) 1
Lag (Note 9) 2%
  (With applying bias light equivalent 5nA signal current.)
Amplitude response . . . . See Fig. 1
Spectral reflectivity . . . . See Fig. 4

Note

1. This value is an effective output impedance, which increases when a tube is inserted in the yoke assembly.
2. The maximum ratings in the table are established in accordance with the following definition of the absolute maximum rating system for rating electron devices. Absolute maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data and should not be exceeded under the worst conditions.
   The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations and the effects of changes in operating conditions due to variations in device characteristics.
   The equipment manufacturer should design so that initially and throughout life no absolute maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variations, equipment component variation, equipment control adjustment, load variation, environmental conditions, and variations in device characteristics.
3. For yoke assembly, use a Hitachi SATICON yoke assembly H9310 or its equivalent.
4. Grid No. 4 voltage must always be greater than Grid No. 3 voltage. The optimum ratio of Grid No. 3 to Grid No. 4 voltage depends on the yoke assembly used. This ratio should be adjusted for optimum performance with regard to signal uniformity and geometrical accuracy.
   This value was actually measured with a HITACHI YOKE ASSEMBLY H9310. In this case, the recommended ratio of Grid No. 3 to Grid No. 4 voltage is 0.75.
5. Adjust the grid No. 1 voltage so that beam current reaches the rated value.
6. Set the target voltage precisely at 50V. Lower voltage will cause deterioration of photoconductor performance, and higher voltage will reduce the service life. The target voltage and current characteristic represent their saturation characteristics. Accordingly, automatic sensitivity adjustment by varying the target voltage is impossible.
7. The sensitivity is a value obtained by measuring a signal current for faceplate illumination of 10 1x by employing a light source at 2,854°K color temperature and dividing the signal current by incident light flux.
   In the case of color sensitivity, the filters listed below are employed respectively, and the color sensitivity expressed in terms of μA/1m of white light before the filter.
   R : FC-HS R1 filter
   G : FC-HS G1 filter
   B : FC-HS B1 filter
8. Spectral transmission factors of the filters are shown in Fig. 7. FC-HS filters are designed of which transmission factor resemble to that of FUJINON TVC-665 or TVC-555 series optical system.
   FUJI PHOTO OPTICAL CO., LTD.
   No. 324 1-chome Uetake-machi,
   Omiya, Saitama Pref.
   JAPAN
   Tel.: (0486) 63-0111 Telex: J22885
9. The lag is the percent of initial value of signal output current 1/20 seconds after illumination is removed, when the signal current is set at 0.2μAp-p and the beam current at 0.4μAp-p.

SPURIOUS SIGNAL

Spurious signal test;
This test is performed a uniformly diffused white test pattern that is separated into two zones shown in Feg. 1.

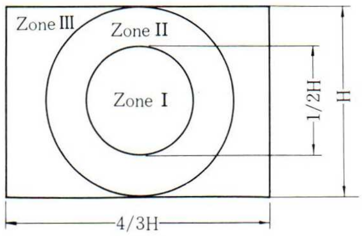


Fig. 1

Spurious signals are evaluated by maximum number of spots and Maximum Spot Nuisanse Value.
Spot Nuisanse Value = Size (percent of picture height) x Contrast (modulation depth)

Definition of blemishes:
Blemishes can be regarded as either spots and sumdges which are small areas of uneven modulation of any signal current between black level and white level.

A spot is defined as a blemish with a maximum linear dimension in any direction of 1.2% the picture height and a contrast in excess of 20% of 100% white level (signal current is 0.2μAp-p), as measured on a waveform oscilloscope (bandwidth 5MHz), black level being defined as 0%.

Table 1 For schanned area of 8.8 mm x 6.6 mm

Spot size (raster lines) (% of picture height)	Zone I	Zone II	Zone III	Total number of spots
Over 6 ($>$ 1.2)	0	0	0	0
6 but not including 3 ($\leqq$ 1.2 but $>$ 0.6)	0	1	2	2
3 but not including 1 ($\leqq$ 0.6 but $>$ 0.2)	1	3	4	4
1 or less ($\leqq$ 0.2)	*	*	*	*
Spot Nuisanse Value	30	70	130	150

1) * Spots of this size are allowed unless concentration causes a smudged appearance.
2) Blemishes with contrast $\leqq$ 20% are not counted.
3) Minimum separation between 2 spots greater than 1 raster line is limitted to 16 raster lines.
4) Spots over 1% of picture height may not have a contrast higher than 20%.

TESTS SPECIFICATION

Testing conditions: (Note 1, 2)

Heater voltage	6.3 V
Target voltage	50 V
Grid voltage	
Grid No. 4	400 V
Grid No. 3	Adjust
Grid No. 2	300 V
Grid No. 1	Adjust
Field strength at center of focusing coil	56G
Faceplate illumination	Adjust
Faceplate temperature	25 to 35°C
Signal current	0.2μAp-p
Beam current	0.4μAp-p
Scanned Area	6.6 mm x 8.8 mm

Specifications:

	min.	ave.	max.
Signal current (Note 3)	0.15	–	– μA
Ampritude response (Note 4)			
Center of picture	25	35	– %
After image (Note 5)	–	–	10 sec
Microphony (Note 6)	–	–	10 sec
Picture cutoff voltage	–100	–	–45 V
Interelectrode capacitance	–	3.5	– pF
Spurious signal	See	SPURIOUS SIGNAL	
Geometric distortion (Note 7)	–	–	1.0 %
Lag (Note 8)	–	–	3 %
Heater current	0.085	–	0.105 A
Field strength of adjustable alignment coil	–	–	4 Gauss
Maximum grid No. 2 current (Note 9)	1000	–	– μA
Signal uniformity	–	–	20 %
Dark current	–	–	1.0 n A
Inspection on a trio of tubes selected for three tubes color TV camera			
Registration (Note 11) Zone I	–	–	0.1 %
Zone II	–	–	0.4 %
Zone III	–	–	0.8 %
Difference of signal Uniformity	–	–	10 %
Difference of gamma	–	–	0.05

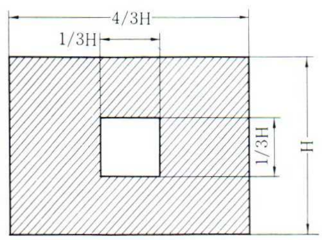


Fig. 2

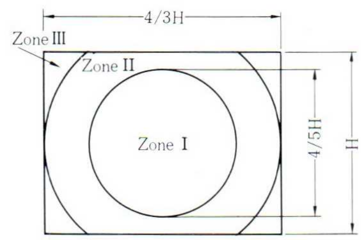
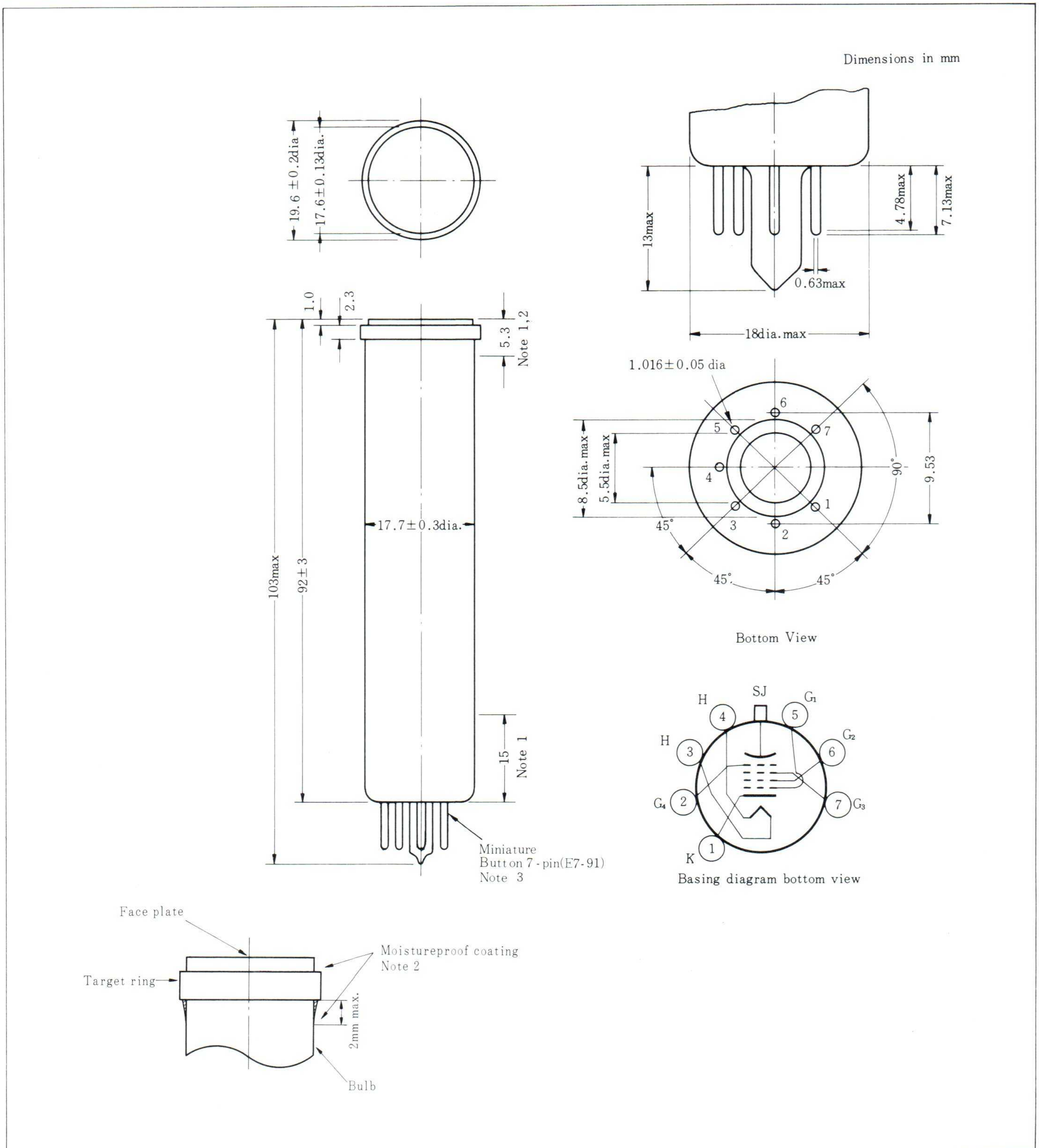


Fig. 3

Note

1. The holizontal scan is essentially parallel to the plane passing through the tube axis and No. 4 pin.
2. Yoke assembly: H9310 (Hitachi SATICON yoke assembly.)
3. Faceplate illumination = 10 lx
4. At 400 TV lines
5. (1) The tube is focused on a test chart, as shown in Fig. 2, for 30 seconds.
   Then the camera is moved to a uniform light background.
   (2) Measure the time unitil the after image is disappear.
6. Measure the duration of microphony time when a small mechanical shock is applied to the tube.
7. The cross stripes test chart is used, and its image compared with an electronically generated raster.
   Any distortions are expressed as percent of picture hight.
8. 50 milliseconds after illumination is removed with bias-light which is equivalent 5nA signal current.
9. Grid No. 1 voltage = 0
10. The test chart is separated into three zones as shown in Fig. 3.

DIMENSIONAL OUTLINE AND BASE CONNECTION



Note

1. The outside diameter value 17.7 ±0.3 mm shall not apply to the target-side 5.3 mm and the stem-side 15 mm section. The value for the stem-side 15 mm section shall be 18.0ϕmm max.. Regarding the target side, refer to Note 2 below.
2. The target section shall be coated with a moistureproof coating as shown in the diagram left side.
3. Socket for this tube is S7-502B made by CHUO MUSEN CO., LTD, 1-CHOME, OHMORI-NISHI, OHTA-KU, Tokyo.

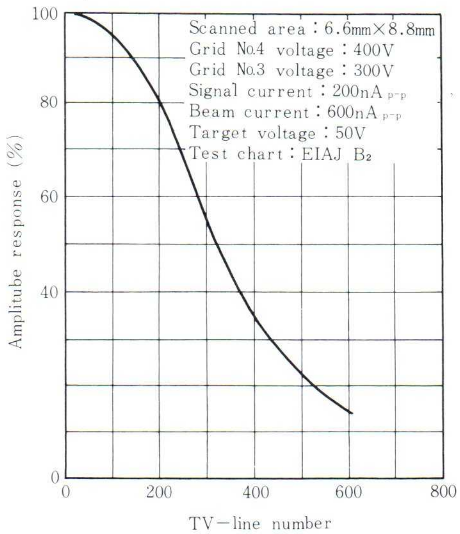


Fig. 1 Amplitude response

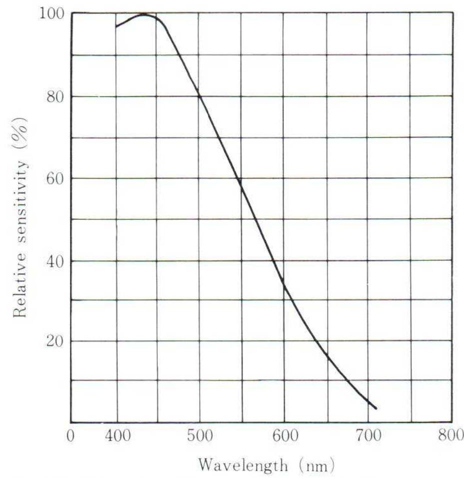


Fig. 2 Spectral sensitivity characteristic

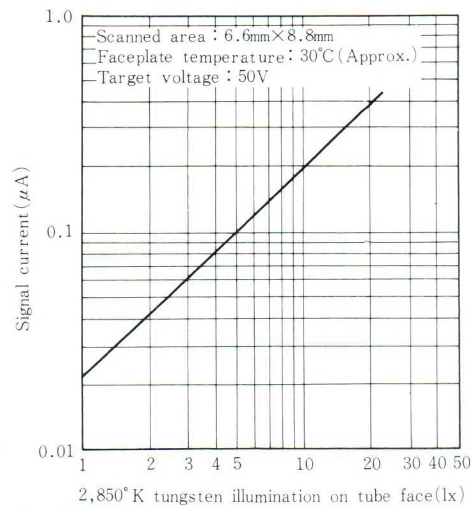


Fig. 3 Light transfer characteristics

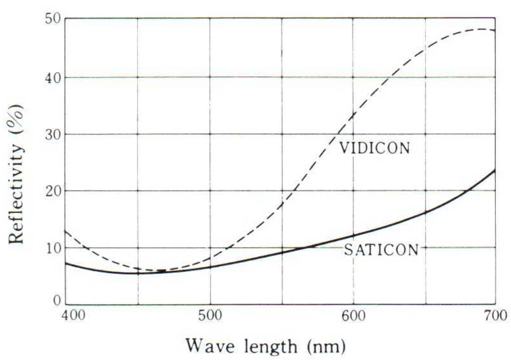


Fig. 4 Spectral reflectivity

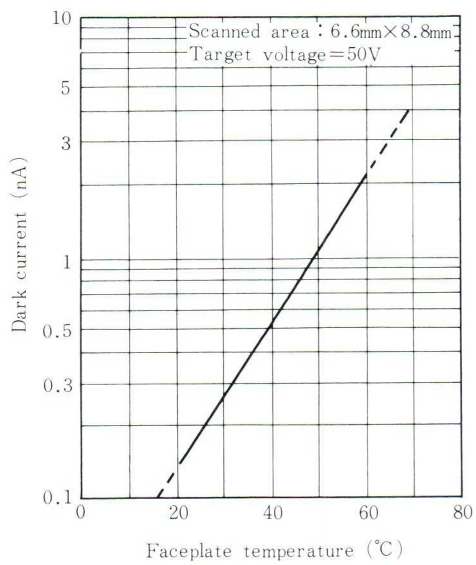


Fig. 5 Faceplate temperature—dark current

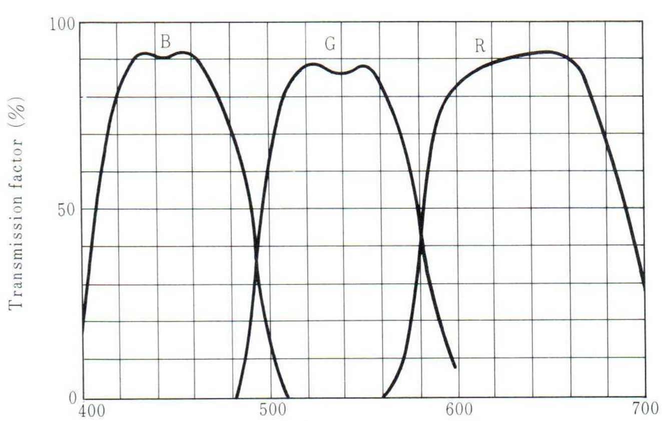


Fig. 6 Spectral transmittance of filters

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Catalog No. CE-E459 Printed in Japan NY-T(H)

HITACHI FIC-SATICON* H9316

1" diameter, filter integrated color (FIC) SATICON for single-tube color TV cameras

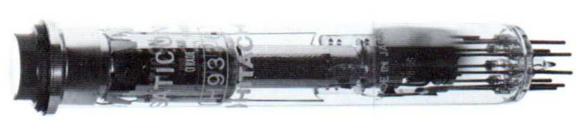
TENTATIVE DATA

HITACHI

*Trade mark

Model H9316 Hitachi SATICON is a new type developed specifically for single-tube color TV cameras. Compared with conventional SATICON, it features a face plate positioned immediately before photoconductive film on which two groups of fine-striped color filters are aligned. The newly developed FIC-SATICON employs a 1" diameter, separate mesh-type, electromagnetic focus and electromagnetic deflection system the same as that of Hitachi Model H9324 SATICON. Since this FIC-SATICON offers high resolution and uniform output signals, fine-quality pictures can be attained.

The H9316 can be appropriately applied to color TV cameras in various fields including education, industries, and CATV. It renders possible the production of compact, lightweight color TV cameras which feature simplified operation. The H9316 employs certain special operating procedures compared with conventional FIC-SATICON; consequently, this Technical Data covers its operating principle, electrical rating, and circuitry.



1. Structure and operating principle of Hitachi FIC-SATICONS

1.1 Face-plate structure

A sectional view of the target unit is given in Fig. 1. Two types of striped color filters are positioned near the photoconductive film surface of a glass face-plate. Images of these stripe filters are projected on surface of photoconductive layer while operating. The stripe filters consist of two groups of stripe filter, one eliminates red beams (having a pitch of 61 microns measured along the horizontal scanning direction of electron beams) and another group which eliminates blue beams (having a pitch of 47 microns). The surface of these filters is covered with a very thin glass film which offers a smooth surface supporting an electroconductive layer. A spurious color signal protecting plate approximately 5 mm thick is provided on the exterior of the face plate.

Further, a dark leveler is provided outside the effective surface of the photoconductive layer to shade light beams entering therein.

1.2 Operating principle

Model H9316 Hitachi FIC-SATICON is designed for single-tube color TV cameras employing a multiplexed frequency separation system. Of the two types of striped color filters described above, the filter which eliminate red beams (having a pitch of 61 microns) offers protecting against red beams incidence on the photoconductive layer surface, admitting blue beams and green beams. However, since the adjacent area where no filters are provided admits all blue, green, and red beams, an appropriate charge pattern of either an minus red or white signal can be produced on the photoconductive film surface, depending to the existence of these filters. An oscillating current corresponding with scanning speed can be obtained by scanning these patterns with an electron beam. Frequency of the oscillating current is given by the equation

$$f = \frac{W}{p \cdot t} \cdot 10^3$$

where,
- f: Carrier frequency (MHz)
- W: Horizontal scanning width (mm)
- p: Pitch of stripe filters (μm)
- t: Effective horizontal scanning period (μsec)

Note: The information contained herein is tentative and may be changed without prior notice. It is therefore advisible to contact HITACHI before proceeding with the design of equipment incorporating this product.

When Model H9316 Hitachi FIC-SATICON is operated by an NTSC system, signals consisting of an oscillating current whose frequency is 3.9 MHz for red beams and 5.1 MHz for blue beams, as well as luminance signals in the form of Y = G + 0.5R + 0.5B, can be obtained from an image pickup tube. These combined signals are separated by two band-pass filters whose center frequencies are 3.9 MHz and 5.1 MHz respectively, and one low-pass filter to ensure R, B, and Y signals. From then on, these signals can be encoded with NTSC, PAL, or various other systems.

The quartz optical low-pass filter illustrated in Fig. 1 has a function to reduce or erase spurious color signals (a phenomenon of generating spurious color at highly contrasty parts having a horizontal frequency component equal to the pitches of stripe color filters which phenomenon being considered difficult to protect with single-tube color TV camera systems employing stripe filters). Therefore, it is regarded as a type of optical low-pass filter. The quartz low-pass filter incorporates a double refraction, double-image quartz single crystal plate being cut out in a specific optical axial direction. Images separated into normal beams are overlapped while being shifted by a separated amount in the horizontal while being shifted by a separated amount in the horizontal scanning direction.

Although it cannot be attained when photographing an extremely polarized object, the above-described feature can be effectively utilized for normal image pickup operation without encountering trouble. Specifically, the spurious color signal protecting plate employed in this system features no degradation in vertical resolution.

The dark leveler at a horizontal edge of the picture area is designed to shade off light beams which fall on the area, so that a dark current level varying with target voltage or temperature variation can always be detected during camera operation. The dark leveler is not an indispensable component of this type of color TV cameras; however, it is applicable to obtaining high-quality, stable pictures when the requirement exists.

2. Electrical ratings and typical application

General Ratings

Heater voltage . . . . 6.3V ±10%
Heater current 0.095A
Focusing system . . . . Electromagnetic focus
Deflection system . . . . Electromagnetic deflection
Capacitance of signal electrode . . . . . 5 pF (without yoke assembly)

Face plate
Red cut-off stripe filter (pitch: 61μm) . . . . . . Built-in
Blue cut-off stripe filter (pitch: 47μm) . . . . . . Built-in
Quartz low-pass filter . . . . Built-in

Photoconductive layer (see Note 1)

Effective scanning area . . . . 9.5mm x 12.7mm
Mounting direction . . . Place (edge line) of the dark leveler at initial point of horizontal scanning and entire body in parallel with vertical scanning direction. (Edge line to be crossed over the plane including index pin and the tube axis.)
Spectrophotometric sensitivity . . . . See Fig. 3
Material . . . . Amorphous selenium
Location . . . . Unrestricted
Overall length . . . . 164 ± 3mm
Max. diameter . . . . 28.6 ± 0.3mm
Weight . . . . 80 grams
Base . . . . Small-button ditetrar 8-pin (E8-11)
Recommended coil assemblied . . SY2516 or equivalent
Resolution (see Note 2) . . . . See Fig. 4

Fig. 1 Sectional view of face plate

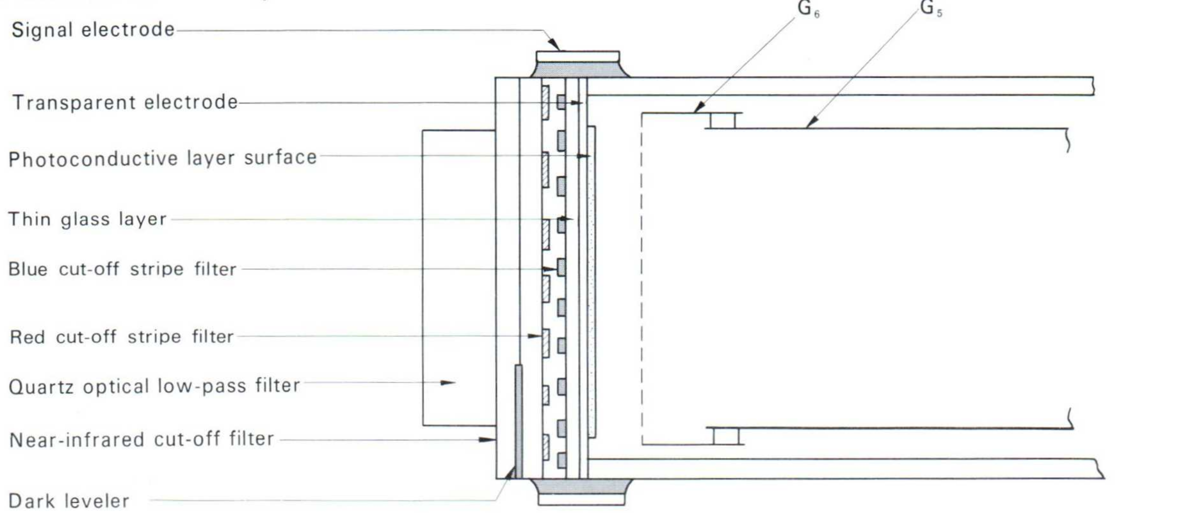
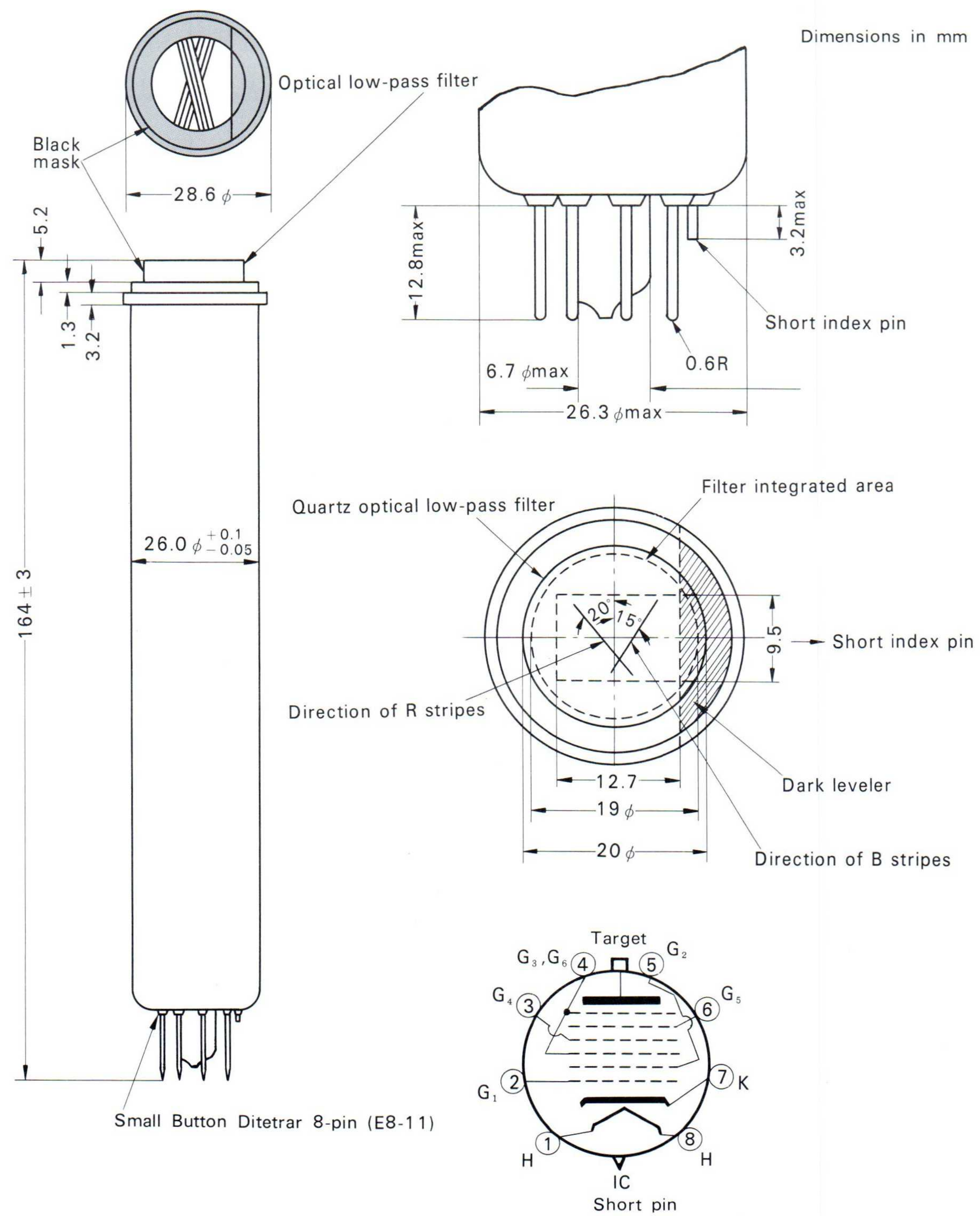


Fig. 2 External Dimension and Base Connection



Maximum ratings (For scanning area of 9.5mm x 12.7mm)

Grid No. 4 voltage . . . . 1500V max.
Grid No. 3 voltage . . . . 1100V max.
Grid No. 2 voltage . . . . 750V max.
Grid No. 1 voltage
  Negative bias . . . . 300V max.
  Positive bias . . . . 0V max.
Signal electrode voltage . . . . 50V max.
Heater and cathode peak voltage
  Heater negative with respect to cathode . . . 125V max.
  Heater positive with respect to cathode . . . . . 10V max.
Dark current . . . . 3nA max.
Signal electrode peak current . . . . 0.75μA max.
Face plate illumination intensity . . . . 500 lx max.
Face plate temperature . . . . $50^\circ C$ max.

Typical operation and performance data

Scanning area . . . . 9.5mm x 12.7mm
Faceplate temperature . . . . $25 - 35^\circ C$
Grid No. 4 voltage 1200V
Grid No. 3 voltage 900V
Grid No. 2 voltage 300V
Beam cut-off grid No. 1 voltage . . . . −45 - −100V
Gamma 0.95
Focusing magnetic field . . . . 72 gauss
Alignment magnetic field . . . . 0 - 4 gauss
Signal electrode voltage 50V
Signal current (at intensity of 20 lux faceplate illumination uniformly distributed over a white object) . . . . 0.30μA PP
Color carrier wave amplitude (see Note 2)
  Red . . . . 0.1μA p-p
  Blue . . . . 0.09μA p-p
Lag (Residual signal current 50 msec. after illumination is removed) with a biaslight current of 10nA 3%

Note 1) Photoconductive layer

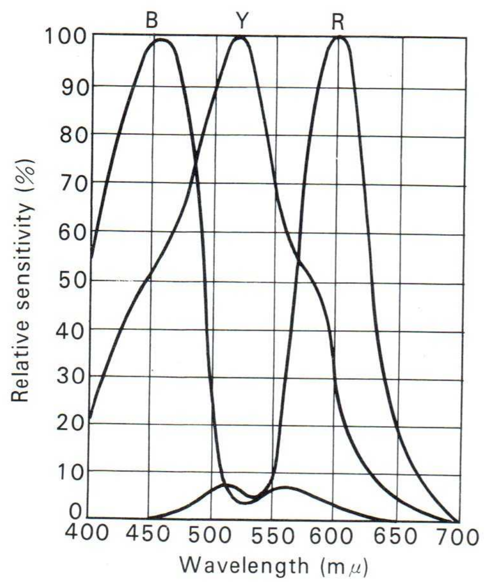
Since the face plate incorporates the two types of stripe filters already mentioned herein, spectral sensitivity of the photoconductive layer depends upon the existence of stripe filters.

Typical spectral response of the standard color TV camera equipped with H9316, measured before a correction of blue, red and luminance channels, is illustrated in Fig. 3. Since all three signals - blue, red, and luminance - are picked up from a single-image pickup tube, the photoconductive film surface requires to have rather tight tolerance of spectral response distribution compared with conventional SATICON tube used in 3- or 4-tube color TV cameras.

Note 2) Resolution

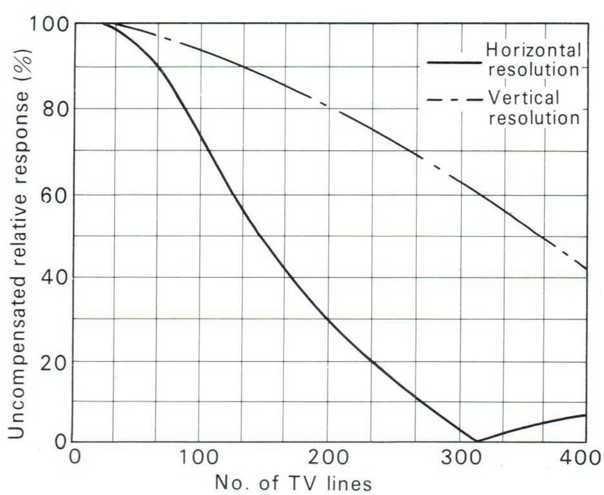
Fig. 4 displays the horizontal and vertical resolution characteristics. Compared with conventional SATICON, resolution characteristics of the H9316 are highly affected by internal optical low-pass filters. The resolution characteristics shown in Fig. 4, according to general definition, represents a detailed photographic capability of subjects. However, the H9316 offers a further advantage of photographic capability to resolve an image of the internal stripe filters. The amplitude of color carrier waves depends upon the amount of this capability.

Fig. 3 Spectral sensitivity characteristics



NOTES : The output values are those measured while illuminating a face plate with light having equal energy distribution.

Fig. 4 Resolution characteristic curve



3. Camera design

Fig. 6 shows a typical circuitry design for single-tube color TV channel incorporating Model H9316 Hitachi SATICON. The following precautions shall be observed during circuit design.

1) Setting and adjusting sensitivity

To maintain sensitivity and the SN ratio of color TV cameras among a certain tolerance, it is recommended to use an EE lens for sensitivity control.

2) Preamplifier

To operate the color TV camera within a certain operating region, it is recommended maintaining preamplifier gain at a certain level as well as closely following the requirements stated above. A low-noise FET amplifier employing a Percival coil is recommended for use at the color TV camera input circuit to improve the S/N ratio. To maintain the Q-value of the Percival coil at a high level, a pot core troidal winding coil is recommended. Overall frequency characteristics of the preamplifier shall be as smooth as 0 to ±3dB within a range of 0 to 6 MHz, which covers the entire color carrier band.

When the color TV cameras are set at standard sensitivity, the target voltage shall be selected so that output current of the image pickup tube becomes 0.3μA average at high light position when the picture shot at an f5.6 lens opening under lamps 3200°K color temperature and 2000 lux intensity tungsten illumination.

3) Focusing circuit

The focusing circuit employs an electro-magnetic focus electron gun to ensure high and uniform resolution over whole picture area. It requires that voltage be applied to the focus coil and grid No. 3. Accuracy of the voltage shall be maintained within ±0.5% to continuously establish the focusing status.

Since images reproduced without discoloration can be ensured by improving the uniformity of resolution over the entire screen, the horizontal and vertical saw-tooth and parabolic wave voltage shall be overlapped with DC voltage, and then applied to grid No. 3 to improve picture quality. Excellent results was obtained by utilizing a variable range of 20Vpp in all directions of the dynamic component.

4) Deflection circuit

Compared with conventional color TV cameras, the H9316 offers extremely simplified operation since no registration adjustment is necessary. However, characteristics of the deflection coil largely affects resolution as well as the focusing circuit mentioned above. Thus, as a standard coil assembly, Hitachi employs SY2516 or equivalent.

The linearity of horizontal deflection shall be maintained within ±2% to minimize the frequency variation of color carrier waves. (No extra linearity shall be required to that of vertical deflection.)

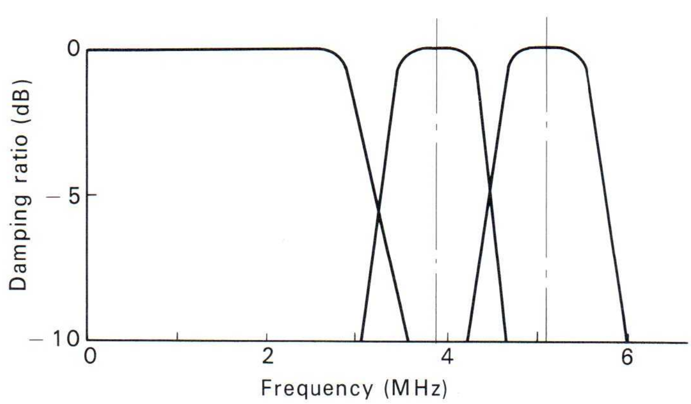
5) Band-pass filter

Model H9316 Hitachi SATICON requires a low-pass filter to separate luminance signals and two band-pass filters to separate color carrier waves. Their typical characteristics are illustrated in Fig. 5.

6) Aperture correction

Since the H9316 employs an optical lowpass filter, general of spurious color signals can be minimized. As shown in Fig. 4, however, a slight degradation of resolution in the luminance signal region is unavoidable; thus, it causes a deterioration of image sharpness. When specifically sharp pictures are required, horizontal aperture correction proves effective. Since the optical low-pass filter does not cover the vertical direction, no aperture correction is required in this direction.

Fig. 5 BPF and LPF characteristics (an example)



7) Compensating the color temperature

Model H9316 Hitachi SATICON is generally used to pickup images under illumination of a tungsten lamp whose color temperature is approximately 3,200°K. When the illumination source is changed while setting the color TV camera at the previously mentioned status, it may result in unbalanced color. Proper color compensation becomes necessary. Color temperature compensation can be achieved by utilizing a color temperature compensating filter widely used for general color film photography, or merely by mounting a knob for differential adjusting of red and blue signal gains.

8) S/N improvement

In the frequency separation system color camera, S/N of color channel is rather poor; and there are so many trials are done to get good S/N. The Percival coil previously written is effective when the resonant frequency is properly adjusted. Another effective method to improve S/N such as an adoption of 1 H signal delay line, though it is comparatively complexed, is preferable. After Y-B-R complexed signal is separated to Y, B and R, color signal(s) may introduced to 1 H delay line. After that, delayed and undelayed signals is added together and the resultant S/N of the color signal(s) may have improved S/N. 3 dB improvement can be anticipated theoretically and practically. The method is applicable to red and/or blue channels if necessary.

9) Beam modulating circuit

An amplitude response of pick-up tube has a general tendency to be limited or reduced when the quantity of electron beam increases. The reduction of the resolutions at such high light area cause undesirable color deteriorations. In order to improve such depression of dynamic range, the quantity of the electron beam is necessarily controlled according to the light level.

Of course, special care and circuitry should be taken so as to not occur undesirable circuit oscillation. (This circuitry is not included or shown in Fig. 6.)

10) Beam compensating circuit

Color TV cameras employs a frequency separation system may reproduce predominant green pictures by the loss of color carrier waves when photographing highly illuminated subjects (such as illuminating spots). To compensate for this phenomenon, automatic beam optimizing circuit and clipping circuit can be utilized. By applying the both circuits, extremely high-quality pictures can be obtained. As a matter of cause, these circuits are not indispensable for color TV cameras, and are used to improve picture quality.

11) Color matrix

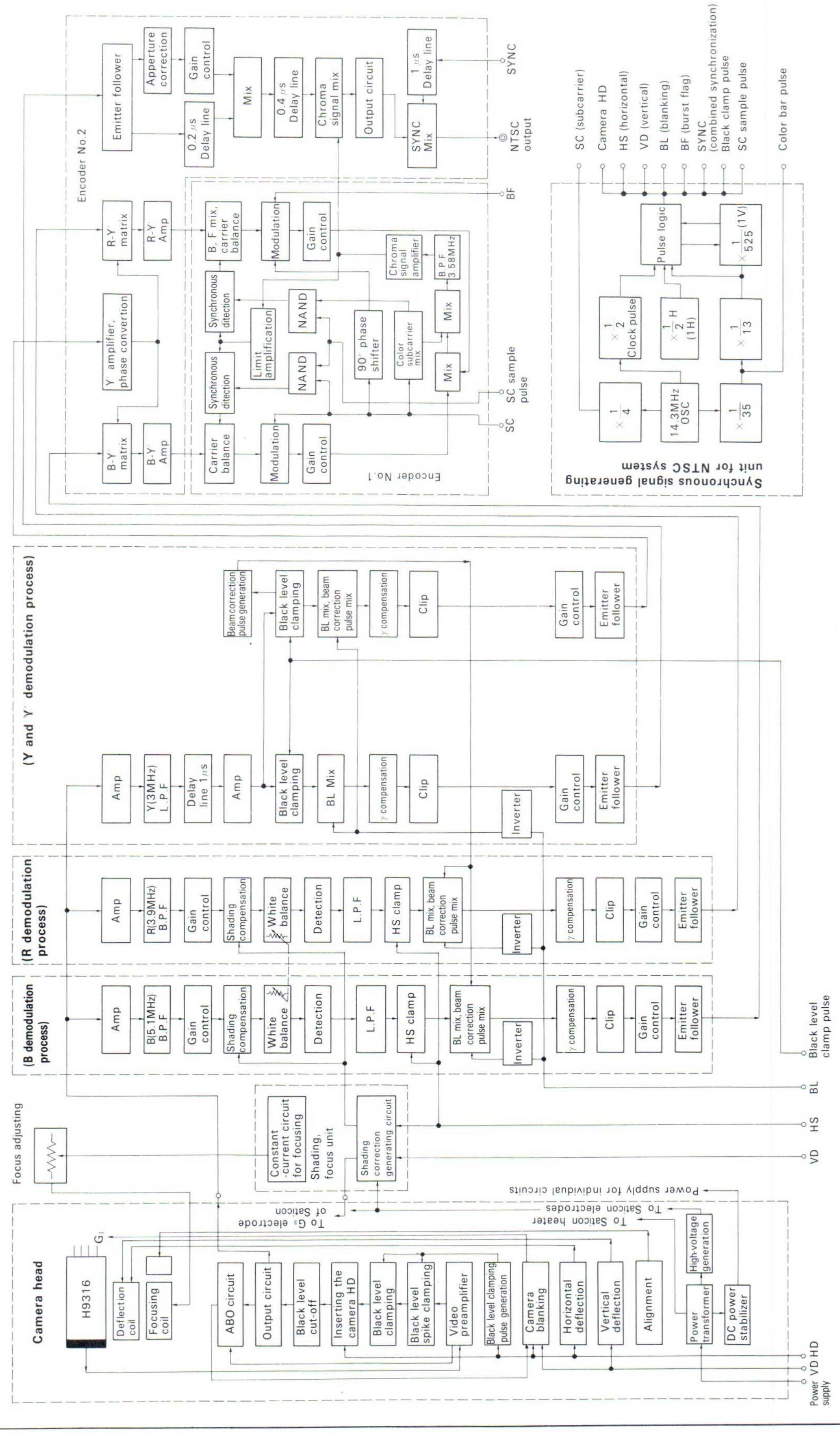
Model H9316 Hitachi SATICON offers red, blue, and luminance signals. The luminance signal is obtained in the form of $Y' = 0.5G + 0.25B + 0.25R$. By using a matrix circuit, this signal can be modified to a broadcasting system processing a signal of $Y = 0.59G + 0.11B + 0.30R$; however, this will result in deterioration of the SN ratio. Since sufficient color reproduction can be actually obtained if no compensation is applied, it can be regarded as $Y = Y'$.

12) Encoder

The H9316 can be encoded with NTSC system, PAL SECAM system or any other systems.

Regarding the NTSC system, since the color subcarrier frequency reaches 3.58 MHz, there is a comparatively wide difference between the subcarrier and the color carrier wave and it is possible, preventing troubles such as generation of beat. However, in the PAL system, since the color subcarrier frequency ranges within the color carrier wave band, the color subcarrier mingle to the band-pass filter or other troubles are likely to occur. These troubles shall be prevented by utilizing tight insulation, separation, shading, or other proper protection provided between both circuits.

Fig. 6 Block Diagram of Color Camera System



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Oct./1978 Catalog No. CE-E447 Printed in Japan NY-T(H)

HITACHI SATICON*
H9324

TENTATIVE DATA

HITACHI

*Trade mark

- 1-inch diameter
- Employing SATICON target
- Magnetic focus, magnetic deflection
- For High quality CCTV color TV cameras

The H9324 employs a new semiconductor as its photoconductive layer, SATICON target, and a newly developed low lag triode gun to decrease beam discharge lag.
It features high resolution, low lag, high color fidelity and negligible flare. Thus H9324 contributes to the high quality CCTV color TV camera with its high performance characteristics.

FEATURES

1. **SATICON target**
   Se-As-Te chalcogenide glass is adopted for photoconductive layer to give excellent characteristics.

2. **Good color fidelity**
   Well balanced spectral sensitivity under 3200°K illumination and cut-off characteristic over 800 nm wave length make good color reproducability possible without no red, green and blue tube selection.

3. **Low lag**
   Lag is enough low for practical operation with a bias light of equivalent 10 nA signal current.

4. **High resolution**
   Resolution is almost comparable with ordinary 1¼ pick-up tube. Low lag and negligible flare also emphasize its high resolution.

Note: The information contained herein is tentative and may be changed without prior notice. It is therefore advisable to contact Hitachi before proceeding with the design of equipment incorporating this product.

March./1978

GENERAL DATA

Heater voltage	6.3 V ± 10%
Heater current	0.095A
Direct interelectrode capacitance:	
Target (signal electrode) to all other electrodes (Note 1)	4.9 pF
Optical:	
Maximum useful scanned area	9.5 mm x 12.7 mm
Tube orientation	Horizontal scan is essentially parallel to the plane passing through the tube axis and short pin.
Thickness of faceplate	2.39 mm
Reflective index of faceplate	1.505
Grid No. 1 voltage for picture cutoff	−40 ~ −100V
Minimum peak to peak blanking voltage:	
when applied to grid No. 1	75 Vp-p
when applied to cathode	20 Vp-p
Focussing method	Magnetic
Deflection method	Magnetic
Overall length	159 ± 3 mm max.
Greatest diameter	ϕ28.6 ± 0.3 mm
Operating position	Any

MAXIMUM RATINGS (Absolute maximum values Note 2)

For scanned area of 9.5 mm x 12.7 mm

Grid No. 4 voltage	1,500 V
Grid No. 3 voltage	1,000 V
Grid No. 2 voltage	350 V
Grid No. 1 voltage:	
Negative bias value	300 V
Positive bias value	0 V
Peak heater-cathode voltage:	
Heater negative with respect to cathode	125 V
Heater positive with respect to cathode	60 V
Target voltage	80 V
Faceplate:	
Illumination	500 lx
Temperature	50°C

TYPICAL OPERATION (Note 3)

For scanned area of 9.5 mm x 12.7 mm

Faceplate temperature	25 ~ 35°C
Grid No. 4 voltage (Note 4)	800 V
Grid No. 3 voltage (Note 4)	640 V
Grid No. 2 voltage	300 V
Grid No. 1 voltage (Note 5)	Adjust
Field strength at center of focussing coil	64 G
Target voltage (Note 6)	50 V
Dark current	0.6 nA
Sensitivity (2,856°K tungsten illumination on tube face) (Note 7)	W 350 μA/1m
	R 120 μA/1m
	G 150 μA/1m
	B 80 μA/1m
Spectral sensitivity characteristic	See Fig. 2
Light transfer characteristic	See Fig. 3
Gamma (Approx.)	1
Lag (Note 9)	2%
(With applying bias light equivalent 10 nA signal current.)	
Amplitude response	See Fig. 1
Spectral reflectivity	See Fig. 4

Note

1. This value is an effective output impedance, which increases when a tube is inserted in the yoke assembly.
2. The maximum ratings in the table are established in accordance with the following definition of the absolute maximum rating system for rating electron devices. Absolute maximum ratings are limiting values of operating and environmental condition applicable to any electron device of a specified type as defined by its published data and should not be exceeded under the worst conditions.
   The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations and the effects of changes in operating conditions due to variations in device characteristics.
   The equipment manufacturer should design so that initially and throughout life no absolute maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variations, equipment component variation, equipment control adjustment, load variation, environmental conditions, and variations in device characteristics.
3. For yoke assembly, use a Hitachi SATICON yoke assembly H9306 or its equivalent.
4. Grid No. 4 voltage must always be greater than Grid No. 3 voltage. The optimum ratio of Grid No. 3 to Grid No. 4 voltage depends on the yoke assembly used. This ratio should be adjusted for optimum performance with regard to signal uniformity and geometrical accuracy.
   This value was actually measured with a HITACHI YOKE ASSEMBLY H9306 or equivalent. In this case, the recommanded ratio of Grid No. 3 to Grid No. 4 voltage is 0.80.
5. Adjust the Grid No. 1 voltage so that beam current reaches the rated value.
6. Set the target voltage precisely at 50 V. Lower voltage will cause deterioration of photoconductor performance, and higher voltage will reduce the service life. The target voltage and current characteristic represent their saturation characteristics. Accordingly, automatic sensitivity adjustment by varying the target voltage is impossible.
7. The sensitivity is a value obtained by measuring a signal current for faceplate illumination of 10 lx by employing a light source at 2,856°K color temperature and dividing the signal current by incident light flux.
   In the case of color sensitivity, the filters listed below are employed respectively, and the color sensitivity expressed in terms of μA/1m of white light before the filter.
   R : FC-HS R1 filter
   G : FC-HS G1 filter
   B : FC-HS B1 filter
8. Spectral transmission factors of the filters are shown in Fig. 5.
9. The lag is the percent of initial value of signal output current 1/20 seconds after illumination is removed, when the signal current is set at 0.2 μAp-p and the beam current at 0.4 μAp-p.

SPURIOUS SIGNAL

Spurious signal test;
This test is performed a uniformly diffused white test pattern that is separated into two zones shown in Fig. 1.

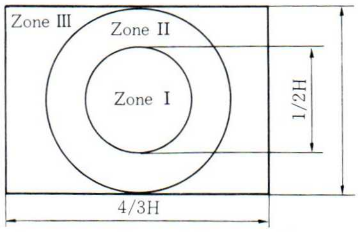


Fig. 1

Spurious signals are evaluated by maximum number of spots and Maximum Spot Nuisance Value.
Spot Nuisance Value = Size (percent of picture height)
x Contrast (modulation depth)

Definition of blemishes:
Blemishes can be regarded as either spots and sumdges which are small areas of uneven modulation of any signal current between black level and white level.

A spot is defined as a blemish with a maximum linear dimension in any direction of 1.2% the picture height and a contrast in excess of 20% of 100% white level (signal current is 0.2 μAp-p), as measured on a waveform oscilloscope (bandwidth 5 MHz), black level being defined as 0%.

Table 1 For scanned area of 9.5 mm x 12.7 mm

Spot size (raster lines) (% of picture height)	Zone			Total number of spots
	I	II	III	
Over 6 (>1.2)	0	0	0	0
6 but not including 3 (≦1.2 but >0.6)	0	1	2	2
3 but not including 1 (≦0.6 but >0.2)	1	3	4	4
1 or less (≦0.2)	*	*	*	*
Spot Nuisance Value	30	70	130	150

1) * Spots of this size are allowed unless concentration causes a smudged appearance.
2) Blemishes with contrast ≦20% are not counted.
3) Minimum separation between 2 spots greater than 1 raster line is limited to 16 raster lines.
4) Spots over 1% of picture height may not have a contrast higher than 20%.

TESTS SPECIFICATION

Testing conditions: (Note 1, 2)

Heater voltage	6.3 V
Target voltage	50 V
Grid voltage	
Grid No. 4	800 V
Grid No. 3	Adjust
Grid No. 2	300 V
Grid No. 1	Adjust
Field strength at center of focussing coil	64 G
Faceplate illumination	Adjust
Faceplate temperature	25 to 35°C
Signal current	0.2 μAp-p
Beam current	0.4 μAp-p
Scanned area	9.5 mm x 12.7 mm

Specifications:

	min.	ave.	max.	
Signal current (Note 3)	0.3	–	–	μA
Amplitude response (Note 4)				
Center of picture	55	60	–	%
After image (Note 5)	–	–	10	sec
Microphony (Note 6)	–	–	10	sec
Picture cutoff voltage	–100	–	–45	V
Interelectrode capacitance	–	4.9	–	pF
Spurious signal	See SPURIOUS SIGNAL			
Geometric distortion (Note 7)	–	–	1.0	%
Lag (Note 8)	–	–	3	%
Heater current	0.085	–	0.105	A
Field strength of adjustable alignment coil	–	–	4	Gauss
Maximum Grid No. 2 current (Note 9)	1000	–	–	μA
Signal uniformity	–	–	20	%
Dark current	–	–	1.0	nA
Inspection on a trio of tubes selected for three tubes color TV camera.				
Registration Zone I	–	–	0.1	%
(Note 11) Zone II	–	–	0.4	%
Zone III	–	–	0.8	%
Difference of signal uniformity	–	–	10	%
Difference of gamma	–	–	0.05	

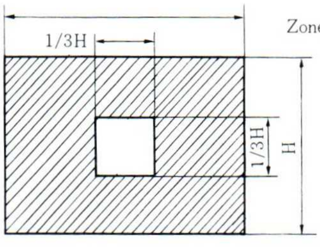


Fig. 2

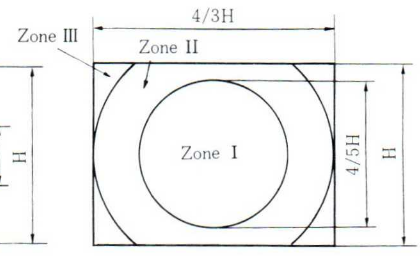
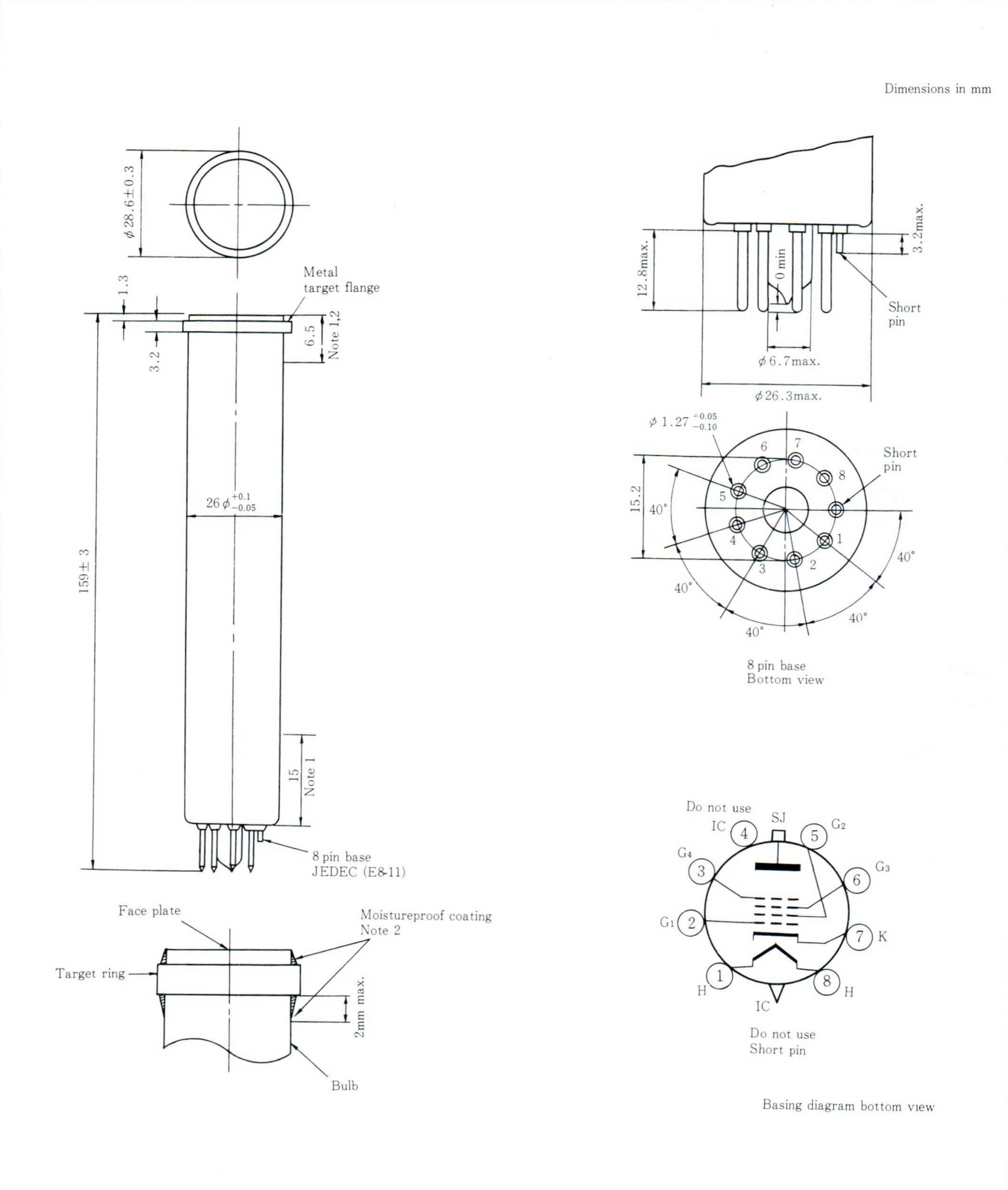


Fig. 3

Note:
1. The horizontal scan is essentially parallel to the plane passing through the tube axis and short pin.
2. Yoke assembly: H9306 (Hitachi SATICON yoke assembly.)
3. Faceplate illumination = 10 lx
4. At 400 TV lines with E1AJ B_2 test chart.
5. (1) The tube is focussed on a test chart, as shown in Fig. 2, for 30 seconds.
   Then the camera is moved to a uniform light background.
   (2) Measure the time until the after image is disappear.
6. Measure the duration of microphony time when a small mechanical shock is applied to the tube.
7. The cross stripes test chart is used, and its image compared with an electronically generated raster.
   Any distortions are expressed as percent of picture height.
8. 50 milliseconds after illumination is removed with bias-light which is equivalent 10 nA signal current.
9. Grid No. 1 voltage = 0
10. The test chart is separated into three zones as shown in Fig. 3.

DIMENSIONAL OUTLINE AND BASE CONNECTION



Note

1. The outside diameter value $26.00^{+0.10}_{-0.05}$mm shall not apply to the target-side 6.5 mm and the stem-side 15 mm section. The value for the stem-side 15 mm section shall be 26.1φ mm max. Regarding the target side, refer to Note 2 below.
2. The target section shall be coated with a moistureproof coating as shown in the diagram left side.

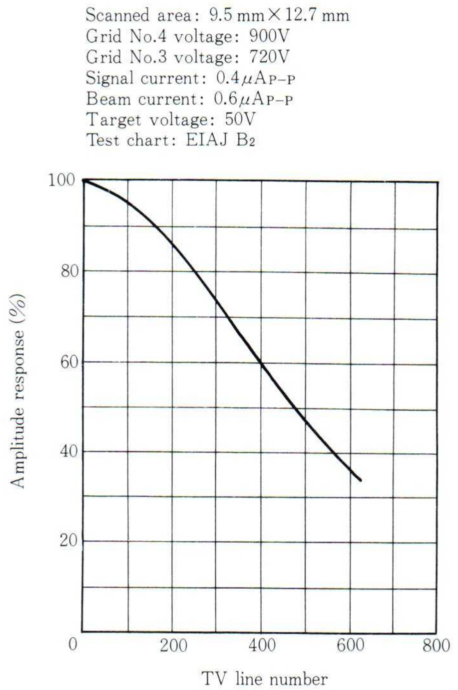


Fig. 1 Amplitude response

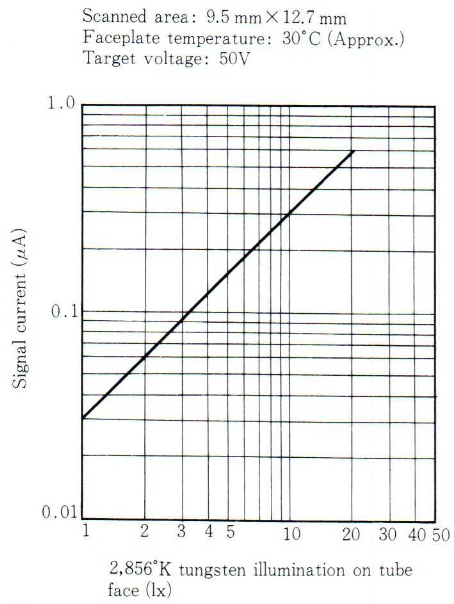


Fig. 3 Light transfer characteristic

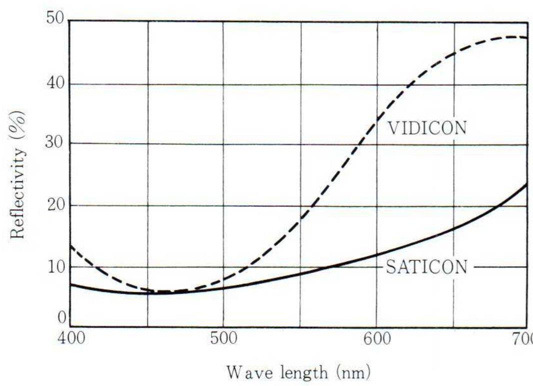


Fig. 4 Spectral reflectivity

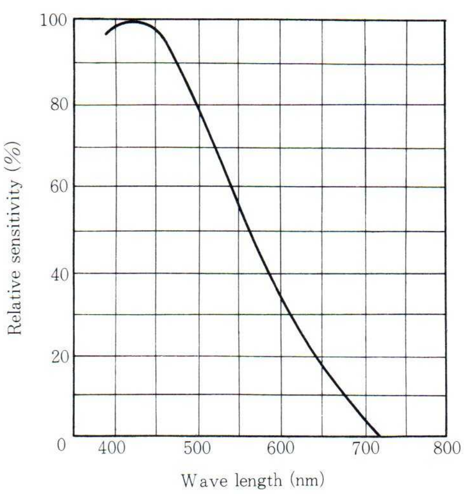


Fig. 2 Spectral sensitivity characteristic

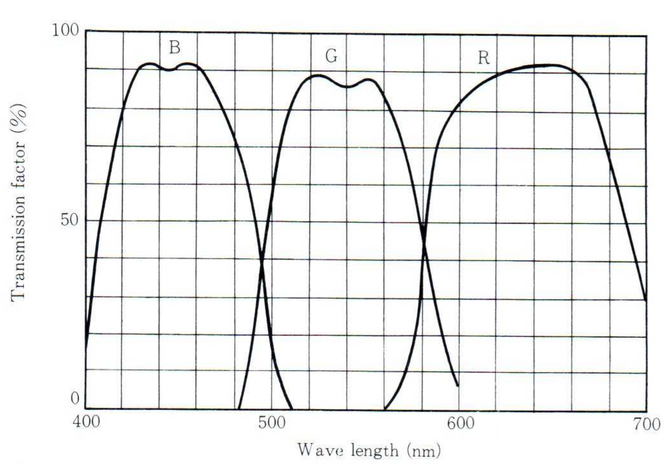


Fig. 5 Spectral transmittance of filters

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