

SYLVANIA NEWS

JANUARY 1954



C. J. Luten, editor
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Sylvania Electric Products Inc.
Vol. 21, No. 1

Sylvania Announces Completion Of Plant Extension For Large Size And Color TV Picture Tubes

W. H. Lamb, general manager of Sylvania's Television Picture Tube Division, has announced that construction of a 200,000 square-foot plant extension to the company's Seneca Falls, New York plant is nearing completion. This extension is to be used for the manufacture of large-size (24 and 27-inch) television picture tubes, and for pilot-line production of color tubes.

The new extension, which was begun in mid-December, 1952, will bring Sylvania's tool manufacturing space—devoted exclusively to television picture tubes—to 687,000 square feet. The company now has 418,000 square feet in Seneca Falls, N. Y.; 218,000 square feet in Ottawa, Ohio; and 51,000 square feet in a new picture tube plant now being erected in Fullerton, California.

Sylvania's plant addition in Seneca Falls will include the latest of semi-automatic equipment—built to Sylvania design—for the manufacture of 24 and 27-inch aluminized and non-aluminized television picture tubes. It will be one of the most modern

and efficient manufacturing units yet devised for TV picture tube production. Mr. Lamb said that this particular section of the building (88,000 square feet) would be in full operation by February, 1954.

The new plant is so designed as to produce high volume at low cost. One complete picture tube manufacturing unit is being installed. All of the specialized equipment, such as baking lehrs, exhaust machines, settling belts, conveyors, is tightly coordinated so that a smooth flow of TV bulbs is maintained from the time the bulb is received and washed to when the bulb is finally packed and shipped.

Although 82,000 square feet of the addition has been earmarked for color screen work, production of color TV tubes, equipment development, and storage, Mr. Lamb said, "It is too early to predict just when we will fully equip and operate this section of the plant for complete color work. At the present time, we intend only to continue our experimentation and operation of a pilot production line for

color tubes and color screens."

Sylvania's Seneca Falls plant is the company's only installation at which color work is being developed.

Other facilities included in the new plant are 4,000 square feet for a new, modern chemical solution room 4,000 square feet for truck docks; and 30,000 square feet presently allocated for general engineering, development laboratories, and equipment development design rooms and offices.

With consumer demand highest for the larger-sized screens, Sylvania's new facilities will concentrate on the manufacture of the 24 and 27-inch picture tube . . . a heavier and bulkier tube. To facilitate employee handling of this heavier type, the plant's new equipment will afford lifting aids and transfers on a semi-automatic basis.

New and specialized equipment for aluminizing picture tubes is being installed, and all manufacturing space devoted to processes, such as screening and lacquering, which require stabilized temperatures and humidity,

(Continued on page 3)

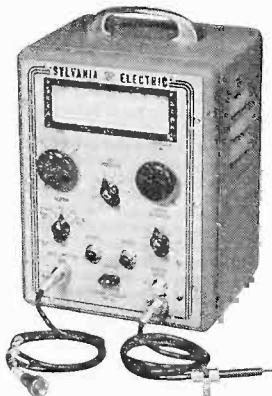
SAVE \$20 ON TWO SYLVANIA TEST INSTRUMENTS

Here's your chance to add two outstanding pieces of Sylvania test equipment to your service bench at a real saving. Until February 15th, your Sylvania Distributor is offering the type 500 Sweep Signal Generator (list price \$139.50) and the type 501 Marker Signal Generator (list price \$129.50) for \$249. This offer, only good for the pair of instruments (neither is available separately at these reduced prices), represents a saving of \$20.

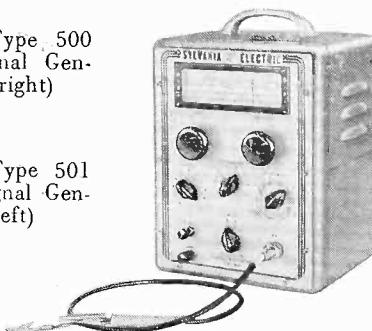
The Sylvania type 500 Signal Generator is designed for Television and FM radio alignment work. It is a companion to the Sylvania 501 Marker Generator. Its dependability, accuracy, freedom from amplitude

modulation and flexibility has made it popular on many of the top TV manufacturers' production lines.

The Sylvania 501 Marker Signal Generator is a highly accurate RF signal generator designed to cover



Sylvania Type 500
Sweep Signal Generator (at right)



Sylvania Type 501
Marker Signal Generator (at left)

the range of Television IF and VHF channel frequencies. It is a high quality, accurate, rugged instrument which may be used with a sweep generator as a marker or alone as an RF generator.

New Sylvania TV Tube Truckload Members

There seems to be no end to the number of Sylvania distributors who are joining, every week, Sylvania's truckload of picture tubes club. Throughout the country, more and more Sylvania distributors continue to stock fast moving best-by-test Sylvania TV picture tubes by the truckload to give their dealer customers the best possible service. Consequently, the demand for Sylvania picture tubes seems now greater than ever before. Latest in this ever-growing list of Sylvania distributors meeting dealer demands are:

Albert Steinberg & Company
Philadelphia, Pennsylvania
Apex Distributing Company
Newport, Kentucky
Bell Radio Supply
Los Angeles, California
Wilco Radio & TV Company
Bronx, New York
Sterling Radio Products
Houston, Texas
Radio & TV Parts Company
San Antonio, Texas

The Steinberg group shown at the top of the page seem to be pleased with their latest truckload shipment. Left to right, front row: William Lieber, Harry Brown, Verne the truckdriver. Second row: Albert Steinberg, Carmen Linsalata, Robert Malone, Leonard Steinberg, Irvin Steinberg, Clifford Monroe, Peter Covich. Back row, left to right: Sylvania Bill Hopkins and Ray Wallrath.

(Continued on page 12)

Sylvania Announces Plant Extension

(Continued from page 2)

will be completely air conditioned.

The older part of the plant, which started manufacture of TV picture tubes in May, 1949, will continue to produce Sylvania's some 50 types of TV picture tubes and general purpose cathode ray tubes.



350 Video Stations In Operation

The rate at which new television stations are going on the air has increased to such a degree during the past few weeks that it appears, as this issue of **SYLVANIA NEWS** goes to press, that nearly 350 transmitters were in operation before the end of 1953.

As of October 18, there were 292 television stations on the air, with eight being launched during the week preceding that date. At the present time, stations are going on the air at the rate of around five per week. Of the 292 on the air, 199 are VHF outlets and the other 93 operate on UHF.

Before the lifting of the freeze on new stations by the Federal Communications Commission, in April of 1952, there were 108 video stations in oper-

ation in this country. The first post-freeze station commenced telecasting in Denver, Colorado in July, 1952, and at the beginning of 1953 only 21 new stations had been launched. This means that about 220 new stations went on the air during the past calendar year.

The processing of new station applications has been simplified considerably by the FCC and construction permits continue to be issued each week. Thus far, 454 commercial TV outlets have been authorized, in addition to 22 educational stations.

The number of television receivers now in use in this country totals around 26,000,000 units.

NEW YORK CITY STATIONS JOIN GROUP FOR BETTER SERVICE

Stations WNBC and WNBT have joined forces with Associated Radio-Television Servicemen of New York, Inc., in a campaign for better, more fairly-priced radio and television receiver service in the Greater New York area.

More than \$2,000 worth of radio and TV on-the-air promotional announcements a day have been pledged in this salute to ARTSNY by WNBC and WNBT. This will include four announcements a day on WNBC radio, in addition to an equal number on WNBT.

These on-the-air spots will outline the objectives and code of ethics of the organization. Other spots will urge viewers and listeners to put their television and radio receivers in top operating condition "to get the most enjoyment out of WNBC-WNBT's new fall programs.

Ernest de la Ossa, WNBC-WNBT station manager, commenting on this new project stated: "We have long realized that we at WNBC and WNBT rely on the hundreds of reputable servicemen who keep millions of radios and television receivers in operation. We commend ARTSNY's

continuing project of better, more fairly priced service and its technical help to its membership."

WNBC-WNBT's performers aiding this promotion will be Faye Emerson, Skitch Henderson, Tex and Jinx McCravy, Richard Willis, Herb Sheldon, Morey Amsterdam, Steve Allen, Gene Rayburn, Jerry Lester, Dean Martin, Josephine McCarthy, Steve Lawrence and Eydie Gorme, in addition to announcers, newscasters, etc.

While urging radio-TV audiences to insist on the best, most reliable service available—the best being provided by ARTSNY—more than \$2,000 a day, seven days a week, will be devoted to the campaign by WNBC-WNBT. Over a month's period, the stations will devote more than \$60,000 to the ARTSNY salute. Many of the TV announcements will display the organization's seal while the station urges televiewers to watch for this insignia when a repair man calls at their home.

Future plans for promoting ARTSNY call for interviews with officials and members of the organization. They will be interviewed by the radio-TV stars listed above.

Half Of Homes Own Video Sets

Nearly half of all families in the United States owned at least one television set in July of 1953, a survey conducted by the Market Research Corp. of America revealed. The exact number of TV set owners at that time was 49 per cent, and represented an increase of 11 per cent in the number of TV homes since January of last year when the previous study was made.

The northeast states, with 69 per cent of television-owning families, continue to include a higher percentage of TV owning families than any other section in the country. Families in the north central states were second with 50 per cent ownership, followed by the Pacific coast states third with 47 per cent; mountain and southwest states were next with 31 per cent and the southern states last with 30 per cent.

However, the largest regional gains were made in the south, with a 25 per cent gain in penetration between January and July. This followed a 71 per cent increase in TV homes during 1951.

The Market Research Corp. report revealed that the biggest current growth in TV penetration percentage-wise is in the rural areas and small towns. In cities with 500,000 population and over, 77 per cent of the families owned TV sets in July; 51 per cent owned sets in cities from 50,000 to 500,000; 31 per cent in towns with 2,500 to 50,000; 26 per cent in towns with less than 2,500 population and 23 per cent on farms.

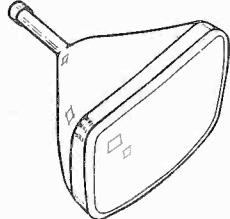


Mrs. Louise N. Miller, owner of Miller's Radio & TV Supply, is shown surrounded by her sales and warehouse staff at the recent opening of her Walnut Creek, California branch. With headquarters at 336 East Eighth Street, Oakland, Calif., and a branch at Richmond, Miller's Radio & TV Supply is one of the largest electronic parts distributors in northern California.

Sylvania Type 21AFP4 21YP4 21YP4A

TELEVISION PICTURE TUBE

21" Direct Viewed Magnetic Deflection
 Gray Filter Glass Rectangular Glass Type
 Single Field Ion Trap Low Voltage Electrostatic Focus
 External Conductive Coating
 Spherical Faceplate



General Data

Focusing Method.....	Magnetic
Deflecting Method.....	Magnetic
Deflection Angle (approx.)	
Horizontal.....	65 Degrees
Diagonal.....	70 Degrees
Phosphor.....	P4
Fluorescence.....	White
Persistence.....	Medium
Faceplate.....	Gray Filter Glass
Light Transmittance (approx.).....	72 Percent

Electrical Data

Heater Voltage.....	6.3 Volts
Heater Current (approx.).....	0.6 Ampere
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes.....	5 μf
Grid No. 1 to All Other Electrodes.....	5 μf
Ion Trap Magnet.....	External, Single Field Type

Mechanical Data

Minimum Useful Screen Dimensions.....	19 $\frac{1}{8}$ x 14 $\frac{3}{16}$ Inches
Bulb Contact, (Recessed Small Cavity Cap).....	J1-21
Base, (Small Shell Duodecal 6-Pin).....	B6-63
Basing.....	12M

RATINGS

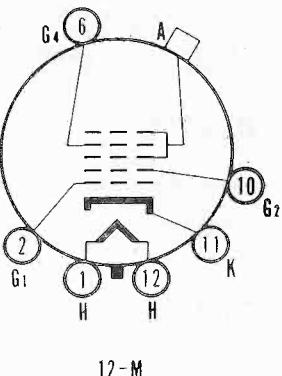
Maximum Ratings (Design Center Values)

Anode Voltage.....	18,000 Volts d c
Grid No. 4 (Focusing Electrode) Voltage.....	-500 to +1000 Volts d c
Grid No. 2 Voltage.....	500 Volts d c
Grid No. 1 Voltage.....	
Negative Bias Value.....	125 Volts d c
Positive Bias Value.....	0 Volts d c
Positive Peak Value.....	2 Volts
Peak Heater Cathode Voltage.....	
Heater Negative with Respect to Cathode.....	410 Volts
During Warm-up Period not to exceed 15 Secs.	180 Volts
After Equipment Warm-up Period.....	180 Volts
Heater Positive with Respect to Cathode.....	

SYLVANIA PICTURE TUBES

Issued as a supplement to the manual in Sylvania News for January 1954

"Ion Trap Magnets" G. E. Fogg, Sylvania News, March, 1953 Vol. 20, No. 3.



SYLVANIA NEWS

SYLVANIA NEWS

CAL SECTION

JANUARY 1954 Vol. 21, No. 1

William O. Hamlin, Technical Editor

receivers do use a type of rigid mounting with which it is necessary to loosen a screw before the magnet can be moved. The end result, as far as the correction of the pin cushioning effect is concerned, is shown in the Figure 1B.

It is fairly common to find one or two pairs of pin cushion magnets on spherical picture tubes in the 24 and 27-inch sizes. Although the pin cushioning is slight, the magnets are very useful in obtaining better horizontal linearity. Some sets have been found to employ no horizontal linearity control, in which case corrections to horizontal linearity can be made with the pin cushion magnets.

Figure 2A shows a condition of horizontal non-linearity existing in a 24-inch spherical picture tube. This

(Continued on page 7)

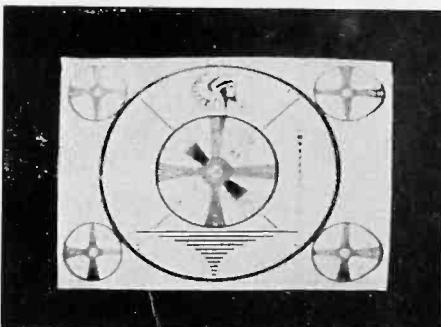


Figure 1B. Pin cushioning corrected after magnet adjustment.

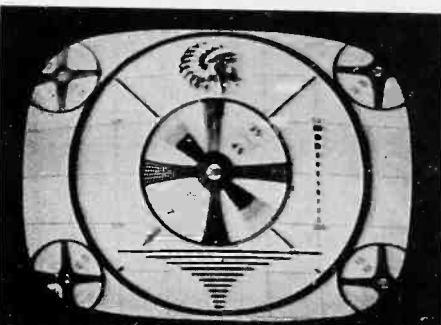


Figure 2A. Horizontal non-linearity in a 24 inch spherical picture tube.

Figure 2B: A circular target pattern on a screen showing horizontal non-linearity, where the vertical lines are curved inward at the top and outward at the bottom, indicating a condition of horizontal non-linearity corrected by magnets.

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PIN CUSHION MAGNETS

By C. A. Peterson - Tube Application Section

SYLVANIA NEWS

TECHNICAL SECTION

JANUARY 1954 Vol. 21, No. 1

William O. Hamlin, Technical Editor

Modern television receivers employ fixed-strength magnets to perform a variety of functions in the operation of the picture tube. Most servicemen are familiar with the adjustment of the ion-trap magnet* and the focalizer, or permanent focusing magnet. However, little information is available concerning the adjustment of the relatively new pin cushion magnets.

The ion-trap magnet serves to separate the heavy ions from the electron beam, thereby preventing damage to the picture tube screen. The focalizer serves to focus the electron beam to a pin-point spot to give clear, sharp pictures.

The pin cushion magnets were designed to correct for an effect known as pin cushioning, which became prevalent with the advent of the cylindrical picture tube and the cosine yoke. This pin cushion effect may be seen in Figure 1A. It is characterized by a squeezing in of the sides of the raster which results in very pointed corners. As the name implies, the overall shape of the raster is that of a pillow, or pin cushion.

The pin cushion magnets may vary in size but they are usually in the form of a bar. They are mounted on, or near, the yoke and on the side towards the picture tube screen. The mountings are such that the magnets themselves extend over the glass portion of the picture tube in front of the yoke. They are always found in pairs, mounted above and below or on each side of the yoke. In some cases magnets are used on all four sides.

Since the entire raster assumes the pin cushion shape, the defect is most easily seen by decreasing the height and width of the raster until all four sides are visible. The photographs in

Figure 1 were obtained under these conditions. Referring to Figure 1A, it is easy to see where the corrections need to be made. Although all four sides are curved, only two pin cushion magnets are used, and these are mounted on the top and bottom of the yoke in this particular instance. The picture tube here is a 17-inch cylindrical model.

In many cases the pin cushion magnets are mounted with a non-magnetic strap which can be easily bent, so that no tools are necessary in making the adjustments. The magnet is tipped toward or away from the picture tube by bending the strap until the proper straight-sided raster is obtained. It may be necessary to rotate the position of a magnet slightly to achieve the end result. It must be remembered that the closer the magnet is to the picture tube, the more pronounced is its effect. Some

receivers do use a type of rigid mounting with which it is necessary to loosen a screw before the magnet can be moved. The end result, as far as the correction of the pin cushioning effect is concerned, is shown in the Figure 1B.

It is fairly common to find one or two pairs of pin cushion magnets on spherical picture tubes in the 24 and 27-inch sizes. Although the pin cushioning is slight, the magnets are very useful in obtaining better horizontal linearity. Some sets have been found to employ no horizontal linearity control, in which case corrections to horizontal linearity can be made with the pin cushion magnets.

Figure 2A shows a condition of horizontal non-linearity existing in a 24-inch spherical picture tube. This

(Continued on page 7)

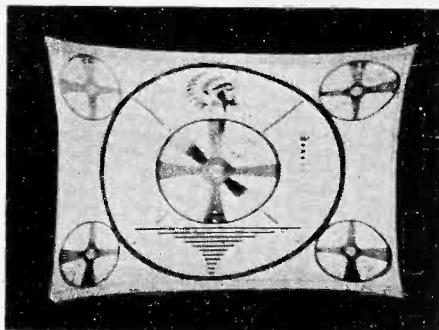


Figure 1A. Height and width reduced to show bad pin cushioning. This set needs magnet adjustment.

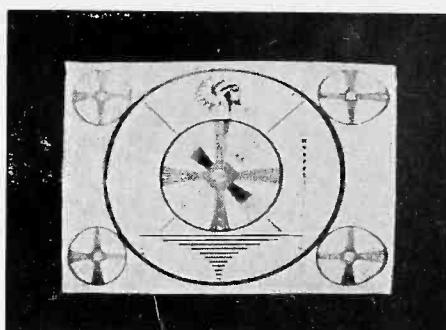


Figure 1B. Pin cushioning corrected after magnet adjustment.

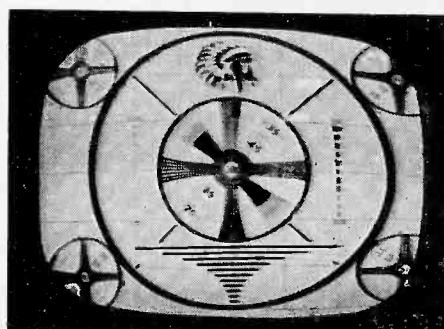


Figure 2A. Horizontal non-linearity in a 24 inch spherical picture tube.

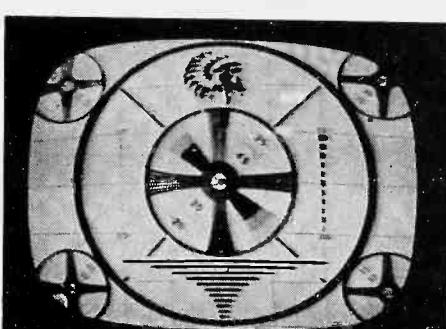


Figure 2B. Non-linearity corrected by magnets.

*"Ion Trap Magnets" G. E. Fogg, Sylvania News, March, 1953 Vol. 20, No. 3.

TV ALIGNMENT ACCURACY

By G. M. Lankard - Test Equipment Department

The television technician desires to equip his shop with test instruments which do the best job at a reasonable cost. The first requirement for the service bench is a good Vacuum Tube Voltmeter, such as the Sylvania Polymer. Secondly, alignment equipment is a necessary adjunct in trouble-shooting and is also used to put the receiver in good condition after rf or if parts replacement.

In purchasing the alignment instruments to be used, the decision should be based upon ease of operation, quality of performance, construction and cost. Obviously, it would not be economical to buy expensive laboratory equipment because of prohibitive prices; also the purchase of inferior equipment is uneconomical because of unsatisfactory service and life. A compromise must be reached which will produce happy customers from satisfactory tv repairs and a happy pocketbook for the repairman.

Television receivers today are produced by mass production methods using standard components and definite limits of tolerance. This means that highly precise laboratory standards of measurement are not necessary for the service shop whose foremost consideration is satisfactory restoration of tv receiver operation. Simple, easily adjusted equipment, within the prescribed accuracy determined by set manufacturers, will best meet the aforementioned requirements.

The design engineers, complying with RETMA standards, have set the tolerance for rf and if alignment at five per cent. Since a primary standard used to calibrate a secondary unit should have an accuracy of at least five times the accuracy of the secondary unit, an accuracy of one per cent is used for tv alignment equipment. Instruments of greater precision for this type of work add negligible improvement to the results and can be difficult to set up.

With the alignment tolerance of one per cent (generally used), any

discrepancy between oscillator and if frequencies is corrected by the fine tuning control on turret tuners or by the main tuning control on continuous-tuning-type tuners. This adjustment for best picture and sound optimizes the relationship of oscillator to received signal to produce the proper mixer output for if amplification. The rf stages are relatively unaffected since the bandwidth of the average receiver rf stage is usually six to eight megacycles which allows an even larger variation than the previously specified one per cent.

However, large inaccuracies of alignment may result in a poor picture due to several factors. First, the fine tuning oscillator adjustment may not have sufficient range to bring in the clearest possible picture. Secondly, large errors, especially in continuous tuners, may cause the rf signal to fall outside the tuner passband which will result in either poor sound and picture detail or sync pulse difficulties, depending on which side of the signal receives poor amplification. Well equipped service shops have accepted the practice of using alignment instruments with one per cent accuracy because of these considerations.

Bearing in mind the service shop's needs, the Sylvania Electric test equipment department offers only instruments of the finest quality

within the accepted standards for television and radio servicing. The Sylvania Model 500 Sweep Generator and the Model 501 Marker Generator are a well-known pair of complementary units because of their accuracy, neat matching appearance, convenient size, and solid construction.

The prime requisites of a sweep generator are a wide sweep to cover the complete bandwidth under test and an absence of amplitude modulation to preclude the possibility of an erroneous passband waveform.* The model 500 not only meets these requirements, but also provides the additional features of phasing control, good linearity, and low leakage from the cabinet which is often important.

The Model 501 Marker Generator has the accuracy necessary for overall alignment and a crystal may be used where greater accuracy is desired. In television inter-carrier sound receivers the 4.5 mc sound channel is accurately defined by the difference between the picture and sound carriers; therefore, it should be aligned with special care. It is recommended that the Sylvania Type 229, 4.5 mc crystal be plugged into the convenient front panel socket of the Model 501 for this operation.

Be economical by buying SYLVANIA.

*If the response is not flat but the variation is known, it can be compensated for in the alignment procedure.

Figure 1. TV alignment set up. From left to right is the Sylvania 500 sweep generator, 501 marker generator, Sylvania TV set and Sylvania 400 oscilloscope.



PIN CUSHION MAGNETS

(Continued from page 5)

particular receiver has one set of pin cushion magnets mounted on the sides of the deflection yoke. By simply adjusting these magnets with respect to the picture tube, the linear pattern in Figure 2B was achieved.

In sets employing both pin cushion magnets and a horizontal linearity control, the pin cushion magnets should either be removed, or positioned as far from the picture tube as possible. The horizontal width and linearity controls should then be adjusted for as linear a picture as possible. Once this has been done, the pin cushion magnets may be used to obtain the final corrections, either to the linearity or for the pin cushioning effect.

A bar generator may be used to detect conditions of picture non-uniformity without altering the size of the raster. The relative spacing between bars indicates the degree of non-linearity while the curvature of the bars toward the edges of the raster indicates the degree of pin cushioning. Figure 3 shows a bar pattern on a 21-inch cylindrical tube in which non-linearity and pin cushioning were purposely introduced. The conditions are evident.

Since the pin cushion magnets are fixed in strength, they require little attention once adjusted. When setting up a new receiver for the first time, or after replacing the picture tube, these magnets should be checked for correct adjustment. A few minutes spent in this manner may add that extra quality which makes a good picture almost perfect.

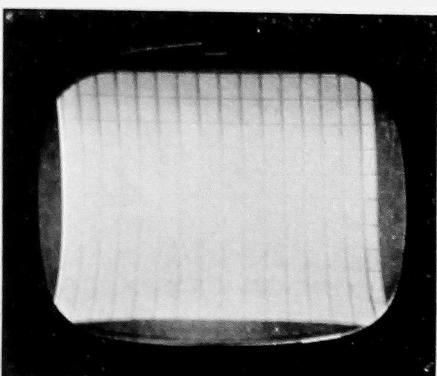


Figure 3. Bar pattern readily shows up non-linearity and pin cushioning.

WHAT'S THE ANSWER

CUSTOMER: How much will it cost to add u h f to my present v h f set?

SERVICEMAN: Your set can be easily converted by the addition of an external unit or u h f channel strip. The antenna necessary for u h f depends entirely on the signal strength and local conditions.

TV receivers with turret tuner inputs may receive the local u h f channel by substituting the appropriate u h f tuning strip for one of the unused v h f channel strips in the set. However, this method limits you in the number of channels received and does not give additional gain that may be necessary in weak signal areas, but it is the least expensive method of conversion.

Converters sell from \$29.95 to over \$50.00, your choice depending on the quality and style desired. Practically all of them will work satisfactorily in converting u h f to the v h f input of your present re-

ceiver. The low or medium priced models give you the best dollar value and the higher priced units should give slightly better performance in fringe areas, better cabinetry and construction. One of the higher priced models even includes a tunable v h f booster.

U H F antennas come in all sizes, shapes, configurations and performance specifications. Prices range from \$6.00 to \$20.00—stacked antennas being approximately double this. Some of the higher priced models are designed for both u h f and v h f reception. In very strong signal areas the built-in antenna of the booster should be satisfactory, if one is included.

Therefore, the cost of obtaining satisfactory u h f reception could be anywhere from \$10.00 to \$100.00 plus installation fee, depending upon the previously mentioned factors and your personal preference.

SYLVANIA TYPE 6BQ7A

The Type 6BQ7A has recently been announced by Sylvania Electric Products Inc. This is another of the v h f cascode amplifier tube series with higher gain than its prototype, the 6BQ7.

The 6BQ7A has a g_m of 6400 μ hos and an amplification factor of 38 with 150 volts applied to the plate. It can be used as a replacement for the 6BQ7 with slight realignment of the tuned circuits.

In addition to cascode amplifier use, it is ideally suited to grounded grid balanced amplifier service for frequencies up to 300 mc.

SYLVANIA TYPE 6CS6

The Type 6CS6, a new tube designed for combined sync separator—noise suppressor use, has recently been announced by Sylvania Electric Products Inc.

It is designed to be used in circuits that accomplish sync separation by feeding the video signal extending in a positive direction to grid three

where the negative grid leak bias development automatically adjusts the clipping level.

Noise suppression is obtained in the 6CS6 by applying a video signal extending in a negative direction to grid one. Strong noise impulses will cause tube cut-off momentarily and thus reduce the harmful effects of noise on picture tube sweep circuits.

The 6CS6 grid number three has a sharp cut-off characteristic to facilitate the clipping action which removes picture information from the sync pulses.

This tube is in the T-5½ bulb style and has a 6.3 volt heater.

REVISED SYLVANIA 219/200 TUBE TESTER SETTINGS FOR TYPE 1B3GT

	A	B	C	D	E	F	G
Old	1.25	2	13578	14	7	U	9*
New	1.25	2	13578	63	7	T	9*

SERVICE HINTS

REMOVING PICTURE WINDOWS ON ADMIRAL RECEIVERS—All late model Admiral TV receivers have removable picture windows so that the picture tube and safety glass can be cleaned.

When the retaining pieces (either wood strips or a snap in channel) are removed, the picture window is free to be removed. Usually, the window does not fall out and there is no room to get behind the glass with the hand. A sharp tool is dangerous because it may scratch the cabinets.

A suction cup, made of an old high voltage cap with a lead pencil run thru it serves very nicely to pull the glass forward or to re-position it.—Herb Bowden, Chicago, Illinois.

G. E. 17C113—Intermittent loss of vertical sync, unstable horizontal sync, too much contrast, with no control were the symptoms.

The tubes checked good and the clipper grid capacitor was not at fault.

Slow warm-up time suggested that the globar resistor in series with the tube filament needed to be replaced. Replacing the resistor restored the set to normal operation.

It was concluded that the filament voltage of the sync clipper tube was so low that it was inoperative. The strange part of it all was that the picture width was nearly normal.—George's Radio, Santa Ana, California

SECONDARY EFFECTS OF DEFECTIVE COMPONENTS — When making a repair such as replacing a defective tube, it is a good idea to check associated components even though the set works properly. This prevents call backs due to weakened parts giving out.

A Motorola 9VT1, Chassis TS-18 which had insufficient width, contrast and volume, was in the shop for repair. The 25L6 audio output tube was shorted. Replacing the shorted tube cleared up the insufficient width and contrast but not the volume which was still weak.

Further checking showed that this sequence had occurred:

1. the tube shorted.
2. cathode resistor burned out.
3. this placed a high voltage across the low voltage cathode electrolytic bypass capacitor which caused it to break down. The new tube worked because of the capacitor short.

Replacing the parts restored the set to normal operation.—Samuel R. Craig, Fraser, Michigan.

PANEL LIGHT FOR SYLVANIA TUBE TESTER—I installed a 6 watt 120 volt bulb and socket underneath the panel of my Sylvania 140 Tube Tester in order to illuminate the chart. It was placed in the center to give even lighting. The glare is cut down by wiring a narrow strip of metal lengthwise on the bulb and adjusting for best effect on the illumination. A switch can be mounted on the top panel to turn off the light when it is not needed.—Daniel H. Webster, Dubuque, Iowa.

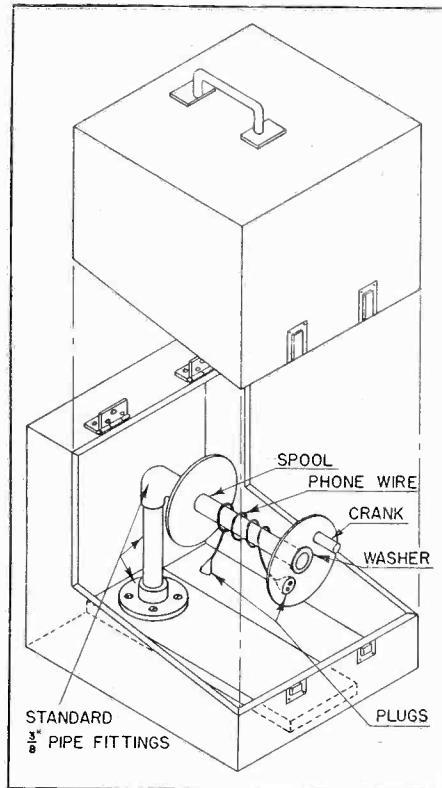
EDITOR'S NOTE: Keep bulb far enough away from chart to prevent scorching.

GENERAL ELECTRIC TV RECEIVERS, EARLY PRODUCTION "A" CHASSIS — When servicing these 14" to 17" sets using selenium rectifier power supplies and series filament strings, look for the following defects:

1. Poor sync with no control of contrast and picture (overdriven)—leaky .01 μ f capacitor at clipper grid. (Ed. note: replace with 600 volt molded type.)
2. No picture—shorted .05 μ f capacitor at cathode of video output tube which removes plate voltage to first video amplifier. (Ed. note: replace with 400 volt unit.)
3. No high voltage—open 4000 ohm resistor in 25BQ6 screen circuit. (Ed. note: replace 7 W units with 10 W units.)
4. Intermittent picture or poor vertical sync—check germanium diodes.

5. Lack of width—check voltage across selenium rectifiers.
—George's Radio Service, Santa Ana, California.

DO NOT USE SCREWDRIVER OR NEON BULB to check the picture tube high voltage. This method will not always show up the trouble and there is danger of bodily injury. Use a High Voltage Probe on your V.T.V.M.



TELEPHONE BOX—I use a set of Wheeler Sound Powered Phones when checking antenna installations. I have arranged them in a special box on a reel and crank assembly. This allows me to roll out the wire and reel it in conveniently and fast.

The reel will hold about 200 feet of wire and is very easily constructed from common pipe. The box itself is so constructed that the wire roll and its stand are accessible when the lid is lifted. There is enough room on each side of the roll to hold the two phone sets. — Donat A. Duquet, Waterville, Maine.

A complete exploded view construction diagram of Mr. Duquet's carrier is shown above.

LIGHT UP WITH SYLVANIA'S NEW SEE-WELL TOOL KIT

FREE WITH YOUR PURCHASES
OF SYLVANIA
TUBES



Service dealers have until March 31st to obtain one of the finest, most useful set of tools a service dealer could own. It's Sylvania's new See-Well Tool Kit. It has a compact flashlight and three tools all in one. Another bright addition to your Sylvania T-N-T Chest. The See-Well Tool Kit is available at your Sylvania distributor for only 15 Sylvania premium tokens. Start saving Sylvania tokens right away. You know, you get one with every 25 Sylvania receiving tubes or every TV picture tube you buy.

No other set of tools will help you like the new Sylvania See-Well Tool Kit. Just think—magnetic Phillips and Flathead screw driver, nylon alignment tool, plus powerful flashlight—and all this in a tough, compact styrene case with clip lock. Your See-Well kit will not include batteries;

any type midget batteries will fit the See-Well.

Now the See-Well flashlight is a high-powered compact flashlight which can be carried in your pocket. Government tested and approved, it can operate on any size midget batteries and is good for many years of use. It has a specially designed head to hold any of the three tools that come with this kit. It is made to fit the tools snugly; no slipping, no turning—you must remove the tool.

The Phillips screw driver is made of tempered steel and is just right for removing backs of sets, chassis work, any one of a dozen jobs. It is magnetic, too, and won't slip from the screw head.

The Alignment Adjuster has a tip that is made of non-conductive plastic and nylon. It is the right size for your fine alignment adjustments.

SYLVANIA NEWS

MERCHANDISING SECTION

JANUARY 1954 Vol. 21, No. 1

The third tool that comes with Sylvania's new See-Well Tool Kit is a standard screw driver head. It has a magnetic head, is made of steel, embedded solidly in lucite plastic. It has a firm, sure grip; won't slip or fall out.

The tough styrene case is a compact unit for carrying and storing your See-Well Tool Kit. Equipped with a clip lock, the case has the further convenience of a specially designed spot for each tool and the flashlight. It can be easily carried in your T-N-T Chest or pocket.

It is easy to see how useful Sylvania's See-Well Tool Kit will be to the service dealer. How many times have you had to do a repair job where light was necessary and you had to fool around with a lamp? Getting it in the right spot for proper light to see, changing the light when you changed position. Or maybe you had to carry a separate hand lamp and cord for the hard-to-see repair jobs.

Sylvania's See-Well has licked your problem, done away with extra gear to carry. The See-Well Tool Kit combines three of the most necessary tools for any repair job with a powerful flashlight that "lights up" your work for you. All you do is fit the tool you need into the specially designed flashlight head and flick it on. You're ready to work—in the dark, if necessary. No more "jockeying" around to get the best light. The Sylvania See-Well spot-lights the particular area you're working on. The light comes right through the translucent neck of each tool head, shines your way to a simple, fast repair job.

You will want to begin saving Sylvania premium tokens today. Remember, it takes only 15 for the See-Well Tool Kit. See your Sylvania distributor for further details.

MAKE SURE YOUR TELEPHONE RINGS OFTEN IN 1955; USE SYLVANIA'S SERVICE DEALER CALENDAR

You can't miss making more money in 1955 if your own personalized calendar on the walls of every home in your community. A calendar tells your prospects and customers who you are . . . what your service is . . . where you are located. It is the easy way for your customers to get in touch with you.

The Sylvania personalized home calendar for 1955 is now available for ordering, as a result of the tremendous response received by dealers for the 1954 calendar. The 1954 service dealer calendar was the first of its kind ever offered exclusively to radio-television service dealers. That calendar, now in use all over the country, is already making more money for hundreds of service businesses.

The 1955 Sylvania service dealer calendar features a special exclusive picture painted by famous Saturday Evening Post cover and feature artist Fred Stanley. This warm, homey painting calls attention to the radio-television service man in a forceful and interesting way.

Here's what the new Sylvania Calendar will do for you.

1) It will put your business sign in every home. Handy, convenient, this calendar will make it easy for your customers to call you when they need your service.

2) It will hang in each home—365 days of the year.

3) A constant reminder of you. It will give you first call over all competitors in your area.

The Sylvania Calendar costs you less than any other advertising you can use . . . only 1½ cents per month, per home. Blanket your territory with your calendars. Make sure the sign of your business is hanging in every home with a radio or television set. Every calendar can bring

The prominent Saturday Evening Post Cover Artist Fred Stanley has painted the picture you see at right on the 1955 Sylvania Service Dealer Calendar. This touching and attractive painting will call attention to your service business every day in 1955.



365 days in 1955, this calendar will remind your regular and potential customers of you. Under each date on the 1955 Sylvania Service Dealer Calendar there is space for personal memos that is sure to be used by every housewife.

you increased business all through the year.

Just think—for only 18 cents per year, you put your personal salesman in each of your prospects' homes.

Your calendars will make money for you every day. And what a return for your investment! Just a few new service calls gained from the calendars you have placed in homes will assure you of increased profits.

The Sylvania Calendar is the lowest cost calendar of its kind you can buy. Offered exclusively as a service to radio-television service dealers,

Sylvania is making this unique calendar available to you at a big saving. It is loaded with items of interest. There's the home appeal features. Every woman will appreciate the new, valuable recipes and home care hints in this calendar which they will hang in preference to all others.

Your personalized Sylvania Calendar will promote your business the way you want to promote it. It tells everybody you're a skilled television and radio technician, that you're reliable, experienced, use the best

(Continued on page 11)

Sylvania's Service Dealer Calendar

(Continued from page 10)

replacement parts, and charge fair prices. The feature . . . What Goes On In Your Television Set? . . . will stimulate interest and understanding of your service problems. Here's a chance to help educate the public and to win the profits expert servicing should bring.

The calendar will serve as your Christmas Greeting for 1954.

Never before has one calendar offered so much to both the service dealer giving it and the customer or prospect receiving it.

Here is how to order your calendar:

1. Fill in the order form at the bottom of page 11 and send it to: Sylvania Advertising Department, 1100 Main Street, Buffalo 9, New York. This is important to insure your shipment this fall.

2. Order enough to cover all the homes in your area.

3. Be sure to include prospects as well as customers.

4. Order envelopes for calendars that you will use as a "Christmas Greeting Card."

5. Order calendars to deliver to prospects personally during the "Holiday Season" and on new calls during the year.

You may obtain a sample of Sylvania's great profit-earning service dealer calendar—free—by writing: Sylvania Advertising Department 1100 Main Street, Buffalo 9, N. Y.

At right you see the way the Sylvania Service Dealer Calendar tells your story to your regular and potential customers. This message is sure to create a greater interest in your service problems. On the back of each page of this calendar are loads of home appeal features that every housewife will appreciate.



ORDER FORM

1955 SYLVANIA SERVICE DEALER HOME CALENDARS

Please enter my order as follows:

QUANTITY	MINIMUM ORDER 100 CALENDARS	AMOUNT
.....	1955 Sylvania Service Dealer Home Calendars @ 18c each.....	\$.....
.....	Envelopes @ \$1.40 per 100.....	\$.....
.....	City or State Sales or Use Tax.....	\$.....
	TOTAL.....	\$.....
Check, Cash, Money Order Enclosed. No C.O.D. orders please.		

Your advertising copy will be printed exactly as you show it here—Abbreviations, spelling, etc. will be just as you show it. Check your ad carefully. Attach a piece of stationery for correct spelling.

Please Print

1st Line

2nd Line

3rd Line

4th Line

Signature:

Position:



New Sylvania TV Tube Truckload Members

(Continued from page 3)

Celebrating the arrival of a truckload of Sylvania TV picture tubes at Apex Distributing Company are Noren and Joe Roell (owner) and John Vail of Sylvania (see middle photo on page 3).

Irvine Davis, Doreen Simpson, Edward Davis, Charlie Davis (owner), Sylvanian Mike Roseto, Sylvania driver John Miley, and Marvin Peddicore were on hand for the truckload shipment of Sylvania picture tubes to



SYLVANIA NEWS

SYLVANIA ELECTRIC PRODUCTS INC.
1100 Main Street
Buffalo 9, N. Y.

For

J. A. Renville
163 Main St.
Luzerne, Pa.

Form 3547 Requested

Sec. 3466 P. L. & R.
U. S. POSTAGE
PAID
Permit No. 3402
Buffalo, N. Y.

JANUARY 1954

PUBLISHED BY

SYLVANIA ELECTRIC PRODUCTS INC.

MANUFACTURERS OF SYLVANIA RADIO TUBES, CATHODE RAY TUBES, ELECTRONIC DEVICES, FLUORESCENT LAMPS, FIXTURES, WIRING DEVICES, ELECTRIC LIGHT BULBS, PHOTOLAMPS, RADIO AND TELEVISION RECEIVERS.

VOL. 21, NO. 1

Bell Radio Supply (bottom photo on page 3).

On hand for still another full truckload of Sylvania picture tubes—this time for Wilco Radio & TV Company,—were left to right: Sylvanian Justin McCarthy, J. Kubbrick, Sol Staple, George Sheehy of Sylvania, Tom Gonzalez, Frank Zodle, Judd Silberman, Jack Wilk, Phil Wilk, Dorothy Wilk and Shirley Silberman (see top left picture).

Don't think the service dealers don't appreciate Sylvania distributors ordering truckload shipments. Just look at the smile on F. P. Keepnick (right) owner of Certified TV Service, as he picks up two best-by-test Sylvania picture tubes from Mal Gordon (owner) Merchandising Manager of Sterling Radio, Houston, Texas. Sylvanian Hugh Luhr looks on (bottom left photo).

Marion John Chelkowski, president and owner of Radio & TV Parts Company, is shown above at right holding his year old son and Vice President. He is celebrating, along with (left to right) Sylvanian Hugh Luhr, Albert Guerrero, Daniel Orta, Gene Janak and Ray Puppe, the arrival of a truckload of Sylvania picture tubes.

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PIN CUSHION MAGNETS

SYLVANIA MODEL 404 OSCILLOSCOPE

By R. E. Grow—Test Equipment Department

SYLVANIA NEWS

TECHNICAL SECTION

FEBRUARY 1954 Vol. 21, No. 2

William O. Hamlin, Technical Editor



Figure 1. Sylvania Model 404 Laboratory Oscilloscope. This instrument is particularly suitable for use in observance without distortion—the sawtooth, square-wave, and other pulses found in television equipment.

The new Sylvania Television Laboratory Oscilloscope, Type 404, is designed to meet advanced television service, production and general laboratory requirements. It features a wide frequency response, with freedom from transients, overshoot, and phase shift, which makes it useful where it is necessary to observe pulse waveforms without distortion.

All waveshapes are accurately displayed on a large, eye-saving 7-inch screen. An important feature is the safety shield in front of the cathode ray tube to protect the operator and the tube. An exclusive rubber mount is used to cushion the cathode ray tube. The rubber mount extends out from the screen and the inside surface is cylindrical so that a paper mask can be used to shield the screen in very bright locations. A cross-hatched

screen is provided which may be placed directly in front of the cathode ray tube for convenience in measuring the pattern deflection and for crayon marking. This clear plastic screen is easily removed, since it is mounted in a round piece of spun aluminum which is shaped to fit exactly over the rubber bezel on the oscilloscope.

One of the essential features of a good oscilloscope is the freedom from response to extraneous electromagnetic fields. An oscilloscope with limited shielding may have a distorted trace when the instrument is alongside a piece of electrical apparatus generating a strong electromagnetic

field. The Sylvania Model 404 is well shielded and may be operated in these fields without such distortion.

Vertical Deflection Amplifier

The vertical sensitivity of the Model 404 is 10 millivolts r m s sine wave input for one inch peak-to-peak deflection. This sensitivity will provide large pictures from small waveform voltages such as individual stages in tv sets and present complete patterns of the television video signal in its entirety. The response of the amplifier is uniform over the frequency range from 10 cycles to 2 megacycles and is usable up to 4

(Continued on page 6)

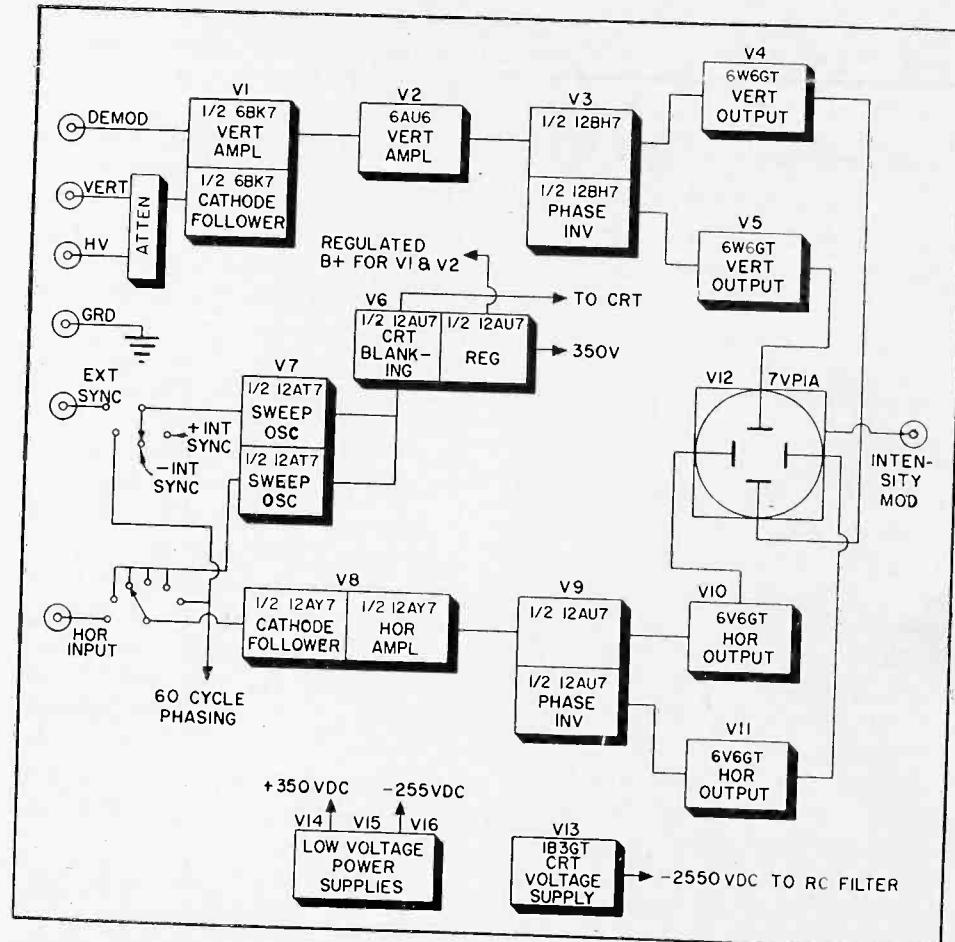


Figure 2. A block diagram of the Model 404 Oscilloscope.

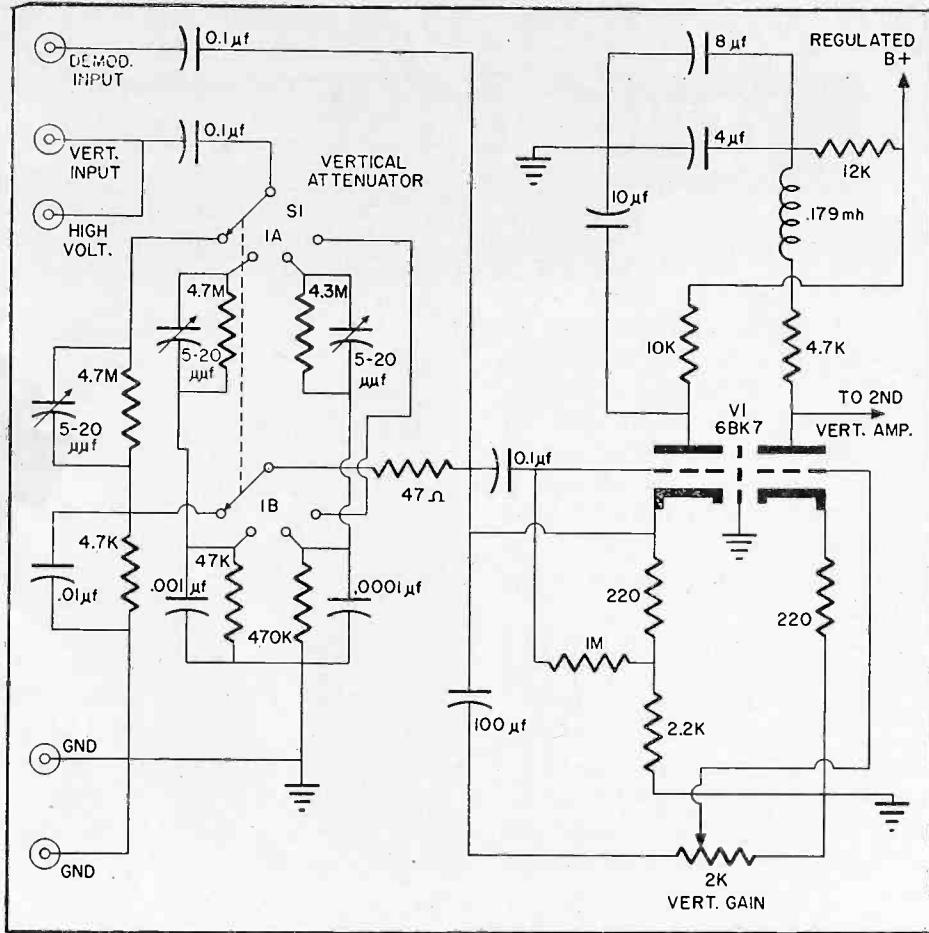


Figure 3. Schematic of the vertical input cathode follower and first amplifier stage, and showing the input attenuation network.

SYLVANIA MODEL 404 OSCILLOSCOPE

(Continued from page 5)

megacycles with an attenuation of 6 db. The input impedance is high across the entire band. The vertical input circuits are shown in Figure 3.

The cathode follower circuit used in the first stage has a very high input impedance of 5 megohms shunted by $26 \mu\text{f}$. The purpose of this stage is to match the high impedance input to the low impedance gain control and to reduce input capacitance. The vertical gain control is in the cathode circuit where it has negligible effect on the frequency response. The signal is amplified by a triode and a pentode which drives the vertical deflection phase inverter. Extra stability is obtained in these stages by using a triode regulator in parallel with the voltage supply. It prevents bounce or flutter caused by extraneous disturbances in the B+ voltage line.

The vertical deflection phase in-

verter utilizes a Type 12BH7 duo triode tube. The cathodes are tied together and one section operates as a grounded-grid amplifier so that the plate signals applied to the push-pull 6W6 vertical deflection output tubes are equal and 180 degrees out of phase with each other. The two output tubes have sufficient output to produce full deflection without distortion. The observed pattern may be inverted by means of a switch.

The total phase shift of both the vertical and horizontal amplifiers does not exceed 10 degrees at any frequency from 10 cycles to 2 megacycles. High frequency response is accomplished by using peaking coils connected in series with the plate load resistors. Several of the stages also have low frequency boost networks to make the response uniform at very low frequencies.

Horizontal Deflection Amplifier

The horizontal sensitivity is 150 millivolts per inch. The horizontal

base line may be expanded so that its total effective length is 21 inches—enough to facilitate detailed examination of small portions of waveforms. The response of the horizontal amplifier is flat between 10 cycles and 600 kc and the multivibrator sweep generator provides a linear time base from 25 cycles to 50 kc with a usable sweep up to 130 kc.

The horizontal sweep may be a sawtooth wave from the internal sweep generator, a 60-cycle sine wave whose phase may be varied by the phasing control, or a sweep voltage from an external source. The sweep generator may be synchronized to either a positive or negative reference signal which is applied to a 12AT7 sync amplifier. The input impedance is 5 megohms shunted by $31 \mu\text{f}$.

The first horizontal amplifier stage utilizes a cathode follower circuit which is similar to the first vertical amplifier stage described in the vertical deflection amplifier section.

A 12AU7 in a phase inverter circuit drives the final push-pull stage which is coupled to the horizontal deflection plates of the cathode ray tube.

(Continued on page 8)

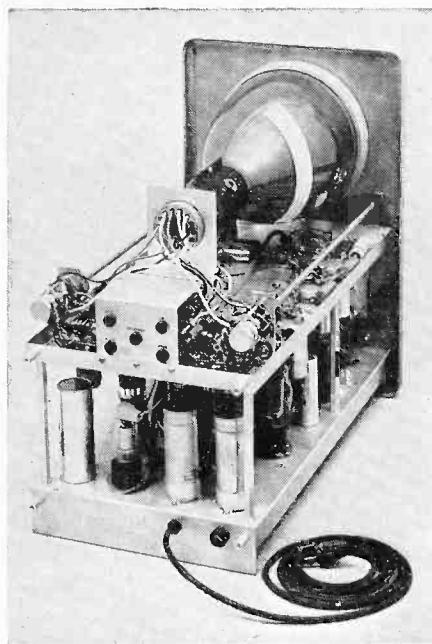


Figure 4. Internal view showing location of the various components. Notice the heavy, rigid construction and the "two floor" shielding of circuits which are of great importance for insuring long and satisfactory service.

TECH TOPICS

RADAR

The term "Radar" is a coined word meaning *Radio Direction and Ranging*. Radar is a device that will tell the direction and distance an object is from the instrument by the means of radio waves. It is used in civilian or peaceful purposes for marine navigation and aircraft control. The military uses it for gun control, locating the enemy and attack warning in addition to its peaceful uses.

The fundamental principle of pulse type radar is fairly simple.* A very short pulse of radio energy is beamed in the desired direction. If this energy strikes an object more solid than air, some of this energy will be reflected back toward the radar station in the same manner that a mirror reflects light. It will return along the same path as the out-going signal and eventually be picked up by the radar station's receiver. Because radio waves always travel at the same speed and the time from sending to receiving can be measured on a 'scope, the distance of the object can be easily measured. (See Figure 1).

The direction of the object is indicated by the position of the antenna

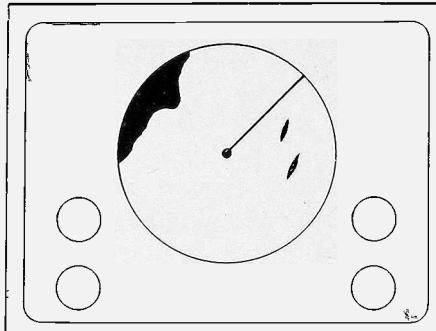


Figure 2. Plan Position Indication (PPI) pattern at a RADAR observation post.

at the time the reflection was received.

The frequencies for radar are so high (often well above the u.h.f. tv frequencies) that great accuracy can be achieved. At very short wavelengths down to fractions of an inch it is possible to use antennas similar to searchlight reflectors.

For marine navigational purposes the radar 'scope presentation is usually circular to show the area surrounding the ship on all sides. The sweep in the cathode ray tube starts in the center and travels outward as each signal is sent out. Simultaneously, the sweep rotates around the tube in synchronization with the antenna.

As an echo is received, the sweep brightens and leaves a radar picture

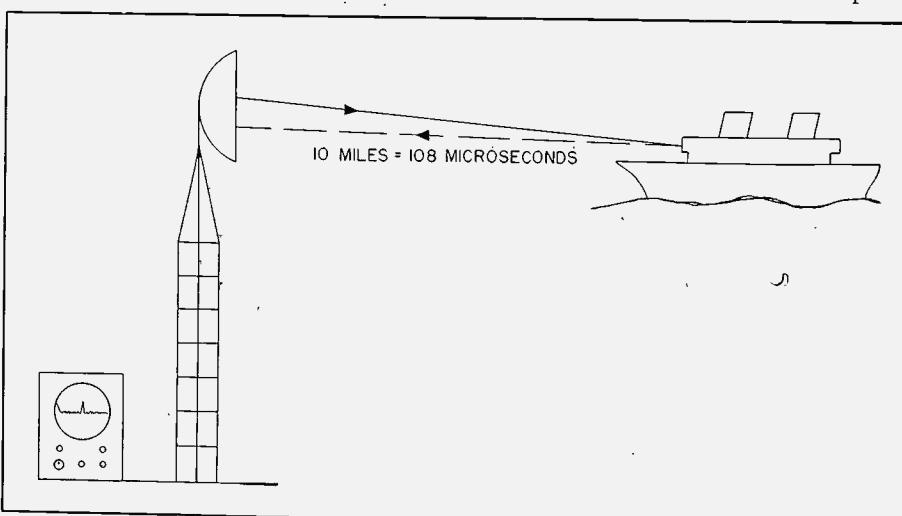


Figure 1. An illustration of the principle of RADAR. The solid line extending from the antenna represents the transmitted microwave radio beam and the dashed line is its reflection from the object under observation.

of the area. (See Figure 2). The dark area at the upper left indicates land, the other dark areas are ships.

The cathode ray tubes used for radar plan position indicators are different from those in ordinary oscilloscopes. They have long persistence screens so that the picture remains long after the sweep has gone by.

Radar, the eyes that see in the dark, protects our coastline from enemy attack, protects our ships from collision with icebergs and other ships, lands airplanes in "visibility zero" conditions, and saves lives of our fighting men in war.

The Federal Communications Commission now has a special Radar Endorsement for Commercial Operator Licenses.

*Other types of radar may use CW, A.M. and F.M.

SYLVANIA TUBE TESTER SETTINGS

We have recently instituted a new system for bringing you Sylvania Tube Tester Settings for tubes which have not yet appeared on the Roll Chart. They will be listed at the bottom of the Technical Manual supplement for the tube type to which they apply. This allows quick and ready reference when needed.

The settings will be listed only for tubes not on the chart, and they will be removed at each Technical Manual revision. This system was begun with the January 1954 issue for the Sylvania Type 6CM6.

TV CRYSTAL REPLACEMENT GUIDE

When	Use
The Set Lists	Sylvania Type
1N64	1N132
CK706	1N132
1N65	1N34A
1N72	1N82, 1N82A
CK710	1N82, 1N82A

NTSC COMPATIBLE COLOR

TV APPROVED

Last month, the FCC put its stamp of approval on the NTSC compatible color television system. Now the way is clear for the networks to broadcast in color, and for the manufacturers to sell color television sets.

At the present time, color television
(Continued on page 8)

Sylvania Model 404 Oscilloscope

(Continued from page 6)

Sweep Generator

The sweep generator produces a linear sweep from 25 cycles to 50 kc. It may be synchronized with either the signal applied to the vertical deflection amplifier, the 60-cycle line voltage, or an external source. Synchronization sensitivity is such that 100 millivolts peak-to-peak amplitude will effect positive lock-in.

Voltage Supplies

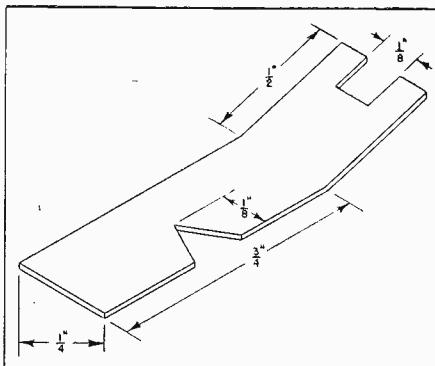
The 1900 volt cathode ray tube accelerating potential insures a bright and well-focused trace. The high voltage supply uses a Type 1B3GT half-wave rectifier tube and a resistance-capacitance filter. The other voltages for the cathode ray tube are obtained from the high voltage divider which improves stability. A 350 positive d c voltage is supplied by a Type 5V4G full-wave rectifier. A negative d c voltage of 255 volts is supplied by a full-wave rectifier circuit using two Type 6X4 tubes.

Accessories

The Model 404 Sylvania Oscilloscope is new and modern in circuitry. The controls on the front panel are of the latest concentric type and are conveniently grouped by function. Accessories included as part of the instrument are a high voltage probe and a demodulator probe. The demodulator probe has a flat response from 20 cycles to 3 mc and will pass a 30 cycle square wave with less than 2 degrees of tilt. The high voltage probe has a dividing ratio of 50 to 1 and has a maximum input voltage level of 25,000 volts.

A wide variety of measurements in television receivers and other types of electronic equipment may be made with the new Sylvania 404 Oscilloscope. This instrument with its modern styling, eye appeal, and sound engineering, will prove invaluable for service, laboratory and industrial applications.

SERVICE HINTS



1. Drawing for "Connecting antenna Clips" showing rectangular strip of metal with notches and dimensions.

CONNECTING ANTENNA CLIPS

—When installing a TV set, I furnish the customer with a set of antenna clips for his own use when it is required to disconnect the set. I have found that by connecting the clips directly to the antenna screws on the set, it is hard to get a good connection. To remedy the situation, I attach to the existing antenna screws a set of home-made terminals, and then connect the antenna clips to these terminals. Material: brass or copper about $1\frac{1}{32}$ " thick.

—Donat A. Duquet, Waterville, Maine.

NTSC COMPATIBLE COLOR

(Continued from page 7)

is very much in the experimental stage. The first receivers will be few in number and quite expensive, and several years will pass before color television will be available for the millions.

The television serviceman can prepare for color television in his town by reading the many articles on the subject, which are appearing in the national radio and television magazines. Color television is inherently more complicated and proportionately more difficult to service than black and white television; and it behooves every television technician, worthy of the name, to give the public competent color television service. Waiting until a color set appears at the shop which needs repairing is too late for learning the whys and wherefores of color. Begin your color television education now by strengthening your foundation in black and white television and studying whatever color material comes your way.

The SYLVANIA NEWS Technical Section will bring you articles on the complete color television system soon. The entire Sylvania engineering staff is backing this project, so that no phase of this new medium of entertainment will be overlooked.

ALUMINIZED SCREENS FOR BRIGHTER PICTURES

By P. M. Reinhardt - Technical Publications Section

SYLVANIA NEWS

TECHNICAL SECTION

MARCH 1954 Vol. 21, No. 3

William O. Hamlin, Technical Editor

This information in Sylvania News is furnished without assuming any obligations

The problem of obtaining brighter pictures from television picture tubes has received considerable attention for a number of years. Many improvements have been made in the past which have increased the electron beam power, and thus increased the picture brightness. Much has been gained by increasing voltages, and by new developments in electron optics which have served to increase the beam power. Such improvements, however useful, were directed only toward increasing the amount of power beamed at the screen.

Another avenue of approach to the problem of increasing picture brightness is to improve the efficiency of conversion of beam power into useful light output on the face of the tube. Considerable research and development work has been done to produce the most efficient phosphors possible for each desired application.

In addition to improvements on the phosphors, a considerable gain in the light output may be obtained by applying a mirror-like metal backing upon the phosphor screen. Since aluminum is the metal usually used, such tubes are commonly termed Aluminized Tubes.

This aluminum film greatly increases the useful light output and also produces a number of other useful effects. The mirror-like metal film improves contrast by reducing the amount of light which normally goes back into the tube, away from the viewer. Such lost light is usually reflected from the inside of the tube back through the screen, thus degrading the contrast in a non-aluminized tube.

The highly conductive metal film improves the secondary emission characteristic of the screen by providing an easier path for removing electrons from the screen. Thus, the

screen phosphors can convert more of the beam power into useful light.

Aluminizing becomes increasingly more important as the trend continues toward higher anode voltages. This is one of the reasons that aluminizing was, and still is, employed in many 5-7-10-inch projection and special purpose tubes. Such tubes were operated at anode voltages very much greater than directly-viewed television picture tubes of comparable screen sizes. With the present demand for larger and larger tubes, which require higher anode voltages, it is evident that aluminizing is an effective method of producing brighter pictures.

Let us now examine some of the requirements of this metal coating. One important factor is that the metal layer must be sufficiently thin to enable the beam electrons to penetrate it and excite the phosphors to produce light. This requires precise control over the process of depositing the metal. The metal film, in spite of its extreme thinness, must be opaque, smooth, and have a high reflectivity. Strength and durability are especially important, since the metal film must

be very thin. The electrical conductivity should be rather high to provide the easy path for removing electrons from the screen, as mentioned above.

Finally, the metal should be chemically inert with respect to the materials and phosphors used in the screen, and should be such that it may be readily deposited upon the screen.

Aluminum fulfills all these requirements, being strong, durable, highly conductive, and having a highly reflective, mirror-like surface. In addition, it may be easily deposited by a vaporization process in a vacuum. Now that we have discussed the reasons for, and factors involved in aluminizing picture tubes, it is of interest to see how the process is accomplished.

Each bulb is carefully inspected to ensure that both the bulb and faceplate are free from imperfections in accordance with Quality Specifications. The bulb, on a vibration-free moving belt, then passes underneath a station where the screen solution is injected into the bulb.* See Figure

(Continued on page 6)

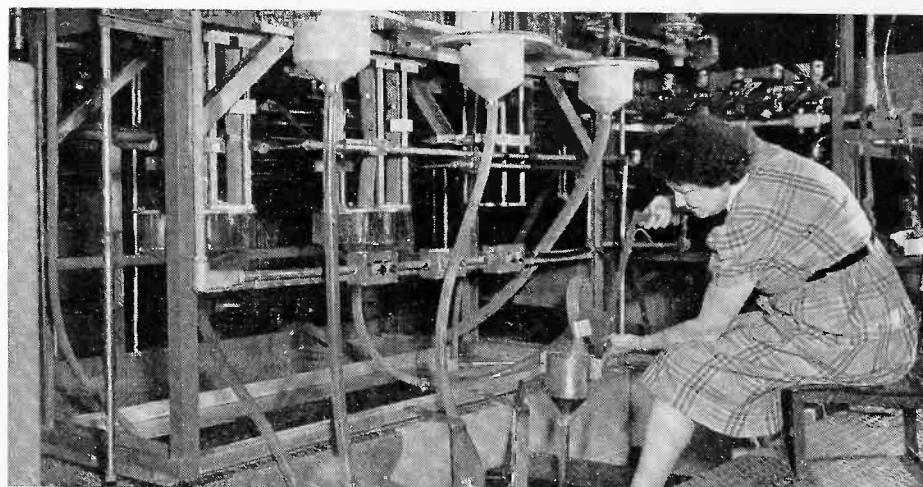


Figure 1. Screen solution being injected into bulb as it passes beneath the operator on a vibration-free moving belt.



Figure 2. A controlled amount of lacquer is deposited upon the water cushion as the tube passes by on the belt.

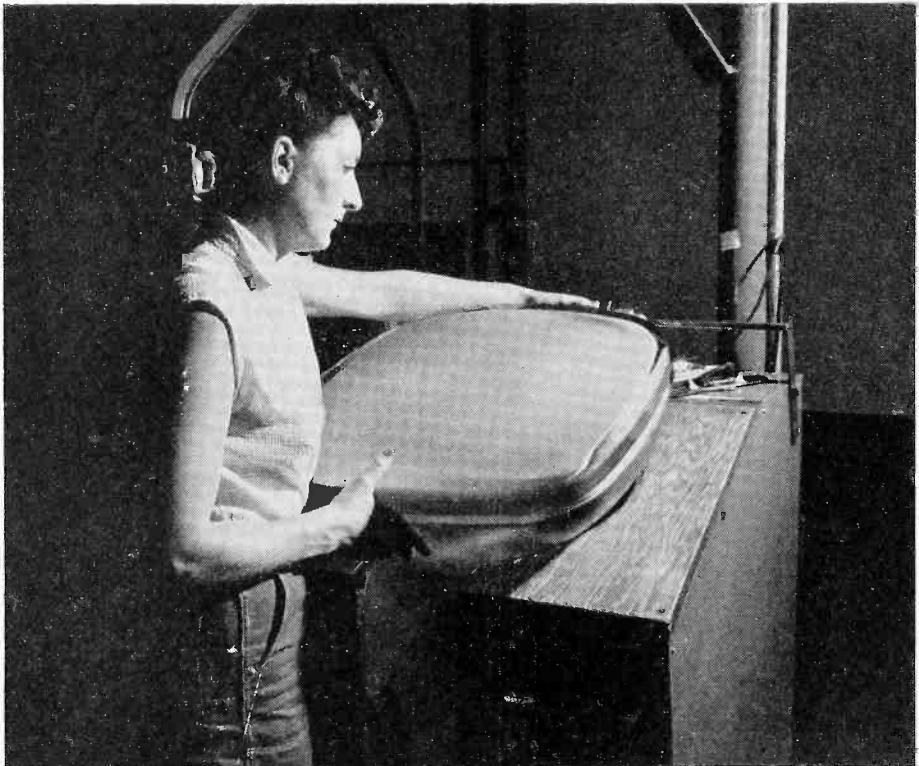


Figure 3. Inspecting lacquer-covered screen prior to application of the aluminum film.

ALUMINIZED SCREENS

(Continued from page 5)

1. After the fluorescent screen has been settled and dried, a water cushion is put into the bulb. This water cushion is necessary to provide a very smooth surface upon which a film of lacquer may be deposited. An operator then deposits a controlled amount of lacquer onto the water cushion, as shown in Figure 2. The water cushion, having accomplished its purpose of forming a smooth surface for depositing the lacquer film, is then carefully and gently poured off. The extremely smooth lacquer layer upon the screen is then dried to form the surface upon which the aluminum film is to be deposited. This lacquer layer is required because depositing the aluminum directly upon the rough, crystalline screen surface would result in a non-reflective, black screen rather than the shiny mirror-like surface which is desired.

The bulb containing the lacquer-covered screen is carefully inspected before the tube is approved for the next step in aluminizing. See Figure 3. The lacquer film is burned out later in the process, after it has served its purpose.

A small amount of aluminum wire is attached to a tungsten wire filament, mounted on electrodes inside the bulb. The air in the bulb is then exhausted so as to create a vacuum in the bulb. This is done to make possible the vaporization of the aluminum. It is necessary to maintain a very high vacuum to ensure vaporization of the aluminum, rather than oxidation of the aluminum and tungsten which would result in undesirable black deposits inside the tube. As the operator at the control

(Continued on page 8)

At 1½ cents per prospect per month, the 1955 Sylvania Service Dealer Calendar is the best, low-cost, direct mail advertising you can use. Ask your Sylvania Distributor for a free copy and full details, or write to Sylvania, Advertising Distribution Department, 1100 Main Street, Buffalo 9, N. Y.

CROSS COMPARISON OF DUO-TRIODE TYPES USED FOR CASCODE AMPLIFIERS

This table has been compiled as a comparison guide for tubes in cascode amplifier or push-pull neutralized amplifier service. They are arranged from left to right by increasing amplification factors. It is sometimes desirable in fringe areas to replace a

tube with one having a higher gain; in addition, some types are more readily available than others.

The comparison chart makes it apparent that for most circuits the 6BQ7, 6BQ7A and 6BZ7 may be interchanged without circuit changes. The

same is true for the 6BK7 and 6BK7A. To interchange the first group one of the second group, it is mandatory to change the cathode resistor. Also, a slight alignment touch-up is necessary for best performance.

	6BQ7	6BZ7	6BQ7A	6BK7	6BK7A
MECHANICAL DATA					
Bulb	T-6½	Same	Same	Same	Same
Base	Small Button 9-Pin	"	"	"	"
Cathode	Unipotential	"	"	"	"
Mounting Position	Any	"	"	"	"
Basing	9AJ	"	"	"	"
ELECTRICAL DATA					
Heater Characteristics					
Heater Voltage	6.3	6.3	6.3	6.3	6.3
Heater Current	400	400	400	450	450
Direct Interelectrode Capacitances*					
Grid to Plate	Sec. I	Sec. II	Sec. I	Sec. II	Sec. I
Input	1.15	1.15	1.15	1.15	1.9
Output	2.55	2.5	2.85	3.0	3.0
Input (Grounded Grid)	1.30	1.35	1.35	1.1	1.0
Output (Grounded Grid)	4.75	4.95	4.75	6.0	6.0
Plate-Cathode	2.40	2.27	2.27	2.8	2.6
Heater-Cathode	0.12	0.12	0.15	0.15	0.15
Plate-Plate (Max.)	0.12	0.15	0.15	0.15	0.15
Grid-Grid (Max.)	0.006	0.010	0.010	0.075	0.075
Plate-Cathode (Grounded Grid)	0.014	0.024**	0.024**	0.003	0.004
RATINGS (Design Center)					
Plate Voltage	250	250 ¹	250 ¹	300	300
Plate Dissipation	2.0	2.0	2.0	2.7	2.7
Heater-Cathode Voltage	200	200	200	90 ²	90 ²
Cathode Current	20	20	20		
CHARACTERISTICS					
Plate Voltage	150	150	150	100	150
Cathode Bias Resistor	220	220	220	120	56
Plate Current	9.0	10	9.0	9.0	18
Transconductance	6000	6800	6400	6100	8500
Amplification Factor	35	38	39	37	40
Plate Resistance	5800	5600	6100	6100	4700
Grid Volts for 10 μ A I_b	100 μ A I_b at -10 V E_c	-11	-10	-9	-12

* External Shield No. 315 connected to cathode.

** Plate 2 to P1 and G1.

¹ May be as high as 300 volts under cutoff conditions in grounded grid circuits with direct coupled drive.

² When operated as a cascode amplifier and the two sections are connected in series, the heater-cathode voltage of the grounded grid stage may be as high as 250 volts maximum with the heater negative with respect to the cathode.

ALUMINIZED SCREENS

(Continued from page 6)

panel increases the current through the tungsten wire filament, the pure aluminum melts and then vaporizes inside the tube. See Figure 4. This aluminum vapor condenses on the inside walls of the tube, becoming the conductive and mirror-like aluminized backing for the screen.

The bulb is then gently "let down" to atmospheric pressure and continues on its way through the processing cycle, finally emerging as one of the best picture tubes available—a Sylvania Aluminized Picture Tube.

*SYLVANIA NEWS, December, 1952.

SYLVANIA 132Z OSCILLOSCOPE AGAIN AVAILABLE

Industry and service-dealer acceptance of the 132Z Oscilloscope has resulted in production of a limited number of these fine instruments.

At its very attractive price of \$169.50, Sylvania offers these features:

A BIG 7-inch screen for easy viewing . . . and . . . a window graph for reading your wave forms to scale. Rugged performance.

Protection . . . with the Sylvania safety glass shield.

Sensitive response . . . only one tenth of a volt will cause a full one inch of height deflection.

Saves time and makes easier the servicing of television in today's highly competitive service business.

UHF STRIP CONVERSION

Our attention has been called to statements previously made in SYLVANIA NEWS on u h f strip conversion which are misleading because the comments were not adequately clarified in regard to different types of channel strips and the quality of reception expected from them. The strips actually referred to in the articles "U H F Converters," June 1953 and "What's the Answer," January 1954 are the double conversion type, where a crystal is substituted for two tubes in the converter.

There are other types of strip converters used by some manufacturers in their 1954 sets which have superior arrangements to provide good receiver gain at u h f.



Figure 4. Pure aluminum is vaporized inside the tube.

SERVICE HINTS

HANDY RAZOR BLADE TOOL—

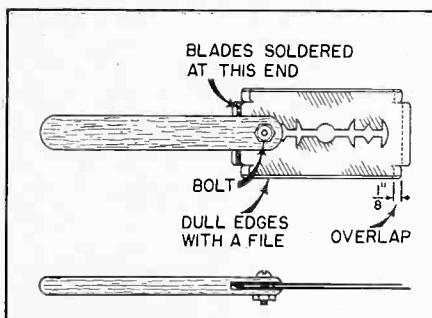
A handy tool for cleaning, scraping or bending variable capacitor plates may be made from two double edged razor blades. Solder the two blades together at one end with the blades positioned so that one extends about $\frac{1}{8}$ " beyond the other. Next fasten a handle by means of a bolt to the end

cleaned. The thin blades make a tight width gauge on small variables of the broadcast set variety without undue pressure on adjacent plates.—John A. Irwin, Wethersfield, Conn.

GROUND STRAP RIVETS ON SOCKETS do not always make a low resistance contact to the chassis. In some instances, I have found that the poor contact caused intermittent reception and oscillation. This is especially true where wafer sockets are used with a center shield and ground strap.

When working on a Silvertone portable radio with this condition, I checked the resistance with an ohmmeter between the center shield and ground on each socket. Three out of five of the sockets had 15 to 20 ohms resistance as the set was jarred or chassis twisted.

To cure this type of trouble, solder a short lead between the center socket shield and chassis.—Adams Radio Service, Williamsport, Penna.



Razor Blade Scraper for Variable Capacitors.

that was soldered. The drawing shows more clearly how it is constructed. Run a file over the sharp edges to remove the possibility of being cut.

By straddling the blades over a capacitor plate, it can be positioned or

CLASS A AMPLIFIER CHARACTERISTICS

By W. O. Hamlin -
Technical Publications Section

Class A Amplifiers are widely used in radio and television receivers. Knowledge of their normal functioning and probable cause of common malfunctions will be of considerable assistance to servicemen in reducing the time required to locate and repair defects. In addition, the experimenter will find this information useful when building and adjusting amplifying equipment. This particular discussion will be confined to amplifiers operating in the audio frequency range.

Class A simply means that the plate current flows at all times. This is accomplished by operating the tube near the center point of the linear portion of the plate current versus grid voltage curve and using signal voltages which do not drive the grid into either the positive region or into the sharp bend near cut-off voltage. Class A operating conditions are shown on a dynamic operating curve* in Figure 1. Notice that operation is

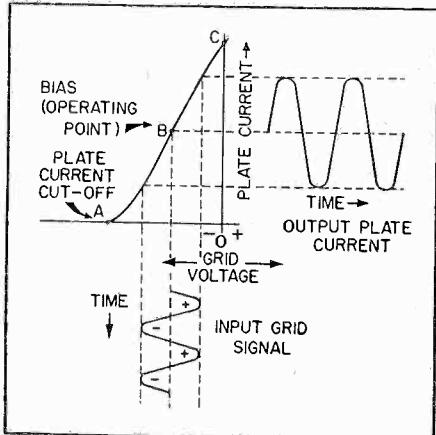


Figure 1. A class A amplifier dynamic operating curve showing how the input signal voltage is amplified in the plate current waveform.

*A static curve to which has been added the effects of the load resistance to show the behavior of the plate current under influence of the signal voltage.

SYLVANIA NEWS

TECHNICAL SECTION

APRIL 1954

Vol. 21, No. 4

William O. Hamlin, Technical Editor

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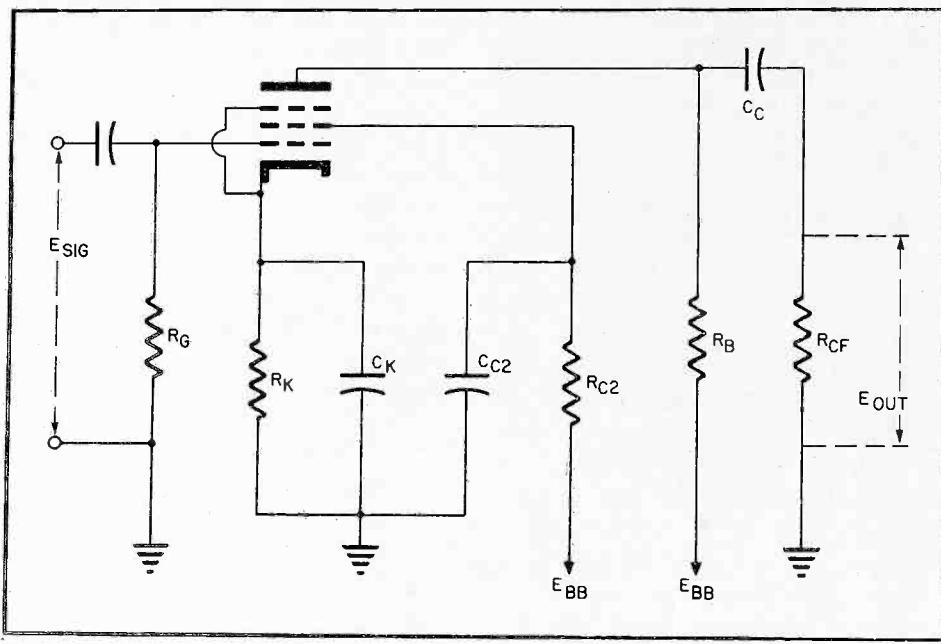


Figure 2. A resistance-capacitance coupled pentode amplifier stage for audio use.

along the linear portion of the plate current curve.

The question often arises as to whether triodes or pentodes should be used for a particular application. The advantage of using triodes is that their dynamic transfer characteristics usually are more linear, and therefore, produce less distortion. Pentodes have the advantage of producing greater power output with small signal inputs. Common practice in receivers is to use a high-mu triode voltage amplifier following the second detector to drive a pentode power tube.

R.C.C. Amplifier Data

The familiar *resistance capacity coupled amplifier* data which appears in the appendix of the Sylvania Technical Manual is compiled by engineers in the Sylvania Radio Tube Division. The purpose of this data is to save time for the design engineer and experimenter and also allows the serviceman to check the design of an

amplifier under repair. Parts symbols used in this article refer to the r.c.c. amplifier shown in Figure 2.

There are many problems in accurately designing r.c.c. amplifiers because of the large number of inter-related factors involved. For instance, a change in the cathode bias resistor will change the bias, plate voltage and current, and stage gain, all at the same time.

The Sylvania Commercial Engineering Laboratory uses the empirical method in determining the cathode bias resistance value to be used and the allowable maximum signal input for less than 5% distortion. That is, the tube is placed in an actual amplifier circuit using RETMA preferred values of resistances which have been found to give the best performance for each class of tube (high mu triode, pentode, etc.). The cathode resistor (R_K) is adjusted for least distortion at maximum signal input for each plate

(Continued to page 6)

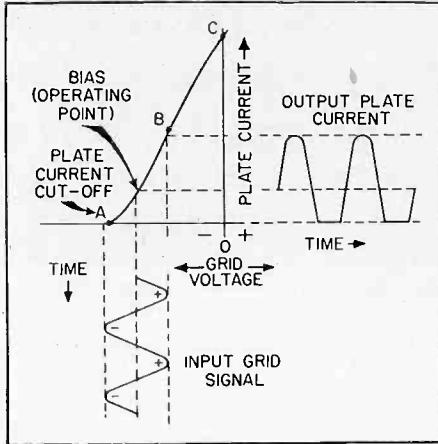


Figure 3. A dynamic operating curve showing distortion caused by too large a grid bias.

CLASS A AMPLIFIER

(Continued from page 5)

and screen resistor combination. This is done at both 100 and 250 volt supply voltages (45, 67.5 and 90 for battery types). In addition, zero bias operation is included for some triodes.

Standard, readily available parts are used to compile this data so that it is practical to use in every day servicing and construction. If it is desired to use values other than those given in the Sylvania resistance coupled amplifier charts, consideration should be given to the factors mentioned in the following sections of this article in regard to part size limitations and distortion.

The Plate Load Resistor

Audio voltage amplifiers usually employ a resistor for the plate load, because the plate resistor (R_b) furnishes a flat response over a wide frequency range, and is inexpensive.

The resistance used may be any value from a few ohms to many megohms, but for normal operation, the load resistance (R_b) should not be less than twice the plate resistance of the tube at the operating point for triodes, and between 0.1 to 0.5 megohms for pentodes. High values of resistance will generally allow a large output voltage to develop. However, several factors must be considered which limit the use of very large resistance values.

One disadvantage of using a plate resistor is that the plate supply voltage must be applied through the resistor and therefore suffers a loss.

If the resistor is too large for the supply voltage available, the plate voltage will be so low that large signal voltages may not be amplified without distortion. With low signal levels, such as found in the low level stages in a receiver, plate voltages as low as 40 volts may be tolerated with some tube types.

Another consideration of importance in pentode amplifiers is the effect of large plate load resistors on frequency response. Higher values seriously limit the high frequencies unless negative feedback is used. As a general rule, for both pentode and triode audio amplifiers, the load resistance (R_b) should never be greater than the grid resistance (R_g) of the following stage—the preferred value being about one quarter of this; e.g., a 125,000 ohm plate load (R_b) would be optimum for a 500,000 ohm grid resistor (R_g).

The Cathode Circuit

Cathode bias is generally preferable to fixed bias because of the self regulation it offers; i.e., if the plate current tends to increase the cathode bias will increase, which in turn has the opposite effect of decreasing the plate current. The resistance size of the cathode bias resistor (R_k) is so chosen that the voltage developed across it equals the desired bias (bias is always measured between the cathode and grid). The grid is negative with respect to cathode, and if gas or grid emission current flows, the bias voltage will accordingly be changed by the potential developed by this current across the grid resistor.

Because the cathode resistor is common to the grid and plate circuits, any output signal voltage which appears across the resistor causes degeneration or a reduction in output. Therefore, the resistor must be well bypassed with capacity unless degeneration is intentional. The size of the capacitor needed is directly related to the low frequency response of the amplifier (the lower the frequency the larger the capacitor) and the cathode resistor value. Because the resistor is relatively small, the cathode bypass capacity value in most receivers is usually over 10 microfarads.

The problems involving the grid resistor and coupling capacitor will be discussed later in the article under "Distortion and Troubleshooting."

Distortion and Troubleshooting

In servicing audio amplifiers, most troubles will appear as distortion in the output. There are several different types of distortion which may occur in amplifiers but *AMPLITUDE* distortion is the type which is of major concern to the radio and television serviceman at the present time.

Amplitude distortion may occur where there is any non-linearity; e.g., if the audio signal waveform is observed on an oscilloscope, the output wave shape will differ from that of the input. Generally where audio or video is involved, amplitude distortion is undesirable because it introduces frequencies in the output that are not present at the input.

The degree of amplitude distortion may depend upon one or more of these parameters: tube characteristics, circuit components, voltages on the tube elements, and the magnitude of the input signal. Serious distortion which the technician deals with usually occurs from overdrive, incorrect bias and defective parts. However, a small amount of distortion is always present ranging from 2 to 10%† in ordinary audio amplifiers but this degree of distortion is unnoticeable to most listeners. High fidelity

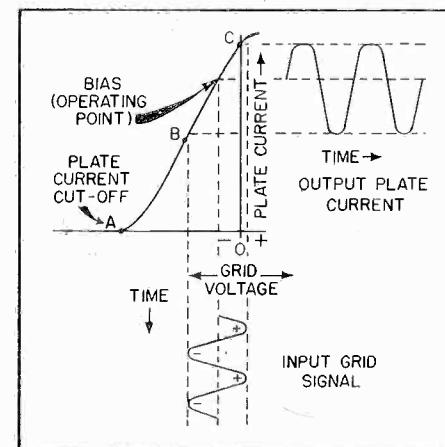


Figure 4. A dynamic operating curve showing distortion caused by too small a grid bias.

†Distortion is measured as the percentage of harmonic content in the output from a pure sine wave input.

amplifiers employ negative feedback or degeneration to reduce distortion to imperceptible levels.

The grid resistor is an important component to consider in an amplifier stage, as it is part of the load circuit of the previous tube and will have a shunting effect upon the input signal. For this reason, a large resistance should be used, but there are certain limiting factors to be considered, because very large resistance values will develop a voltage across it from grid current flow. While it is assumed that there is no flow of grid current in a Class A Amplifier, there is actually a slight current in the order of microamperes. The current flowing from cathode to plate passes through the grid structure and in a random manner some of the electrons are bound to strike the grid and remain there, thus causing a slight flow of negative grid current. This current, even though it is very small, will develop a voltage of considerable size if it passes through a large resistor and makes the grid more negative in respect to the cathode. The negative grid voltage will be very large if the grid resistor circuit is open—it will cut-off the tube entirely (called "blocking"). An illustration of distortion caused by too high a bias is illustrated in Figure 3. This condition may also be caused by too large a cathode bias resistor (R_k).

Use may be made of this current to develop a small amount of grid bias for so called "Zero Bias" operation. The grid bias resistor is intentionally made large (10 megohms is standard in the Sylvania R-C Amplifier Chart) and the cathode resistor is eliminated. "Zero Bias" operation is quite popular in 5 tube AC-DC radios using triodes such as the 6AT6 and 12AT6. Only very small signal inputs may be handled, in the order of .2 to .9 volts depending on the plate voltage, and therefore is used only in low level stages in receivers.

The positive d c grid current flow results from residual gases in the tube envelope. This d c current flowing from ground through the grid leak resistor (R_g) to the grid will cause the grid to develop a positive d c voltage. If the flow of current or resistor is

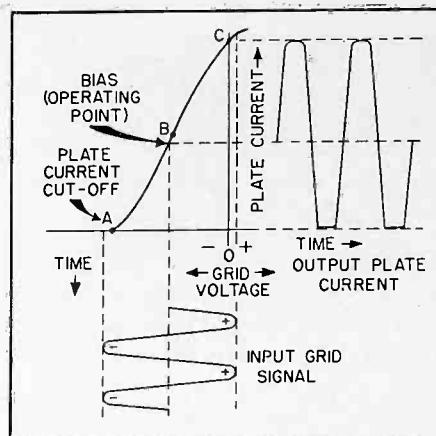


Figure 5. A dynamic operating curve showing distortion caused by overdrive (too large a signal input).

large, the tube may be damaged (the gassy tube results in this condition). Some tube types have more residual gas than others and the maximum allowable grid resistance will vary accordingly. Because of the self regulating characteristic of cathode bias, a larger grid resistor is permissible than for fixed bias. It is customary to include the maximum control grid circuit resistance in the characteristic ratings for power tubes, such as the 6S4 and 6BK5, because if the resistance was too large the grid would become increasingly more positive and would eventually cause the tube to destroy itself.

Distortion caused by positive grid current, with cathode bias also applied to the tube, is illustrated in Figure 4. This condition may also be caused by too small a cathode resistor. The positive grid caused by the residual gas current may be verified by checking the grid voltage with a VTVM with an extremely high input resistance such as the Sylvania Polymeter (input resistance 17 megohms) after eliminating the possibility of a leaky coupling capacitor.

The leaky coupling capacitor (C_o) which plagues the home bc receiver also causes the audio amplifier grid to be more positive than normal. Consequently, the input signal voltage is no longer entirely in the negative grid voltage region and distortion results. Figure 4 shows how the waveform of this condition would appear on an oscilloscope superimposed on a dynamic curve.

When replacing a defective coupling capacitor (C_o) use one which has a voltage rating higher than the supply voltage of the set. Also, it should have a capacity equal to or greater than the original, as smaller values will reduce the bass or low frequency amplification of the stage.

Distortion may also be caused by decreased screen or plate voltages accompanied by decreased output. The lower voltage decreases the cathode bias voltage due to the lower plate current. The net result is that that decreased bias may cause positive clipping of the input signal.

In television amplifiers this causes sync pulse clipping which results in a jittery picture. In audio the lower output may be accompanied by audible distortion. The most common cause of this condition is a leaky or nearly shorted capacitor connected from a high B plus voltage point to ground. A totally shorted unit will practically reduce the output to zero.

Lastly, distortion resulting from signal clipping may result from too much signal input or overdrive. This is illustrated in Figure 5. Both plate current cut-off and grid current occur. The most common cause of this condition in radio and television receivers is from insufficient or no Automatic Volume Control (AVC). On strong signals the distortion may be so bad that sound becomes almost unintelligible.

If distortion is suspected in a receiver (either television or radio), the cause is most easily tracked down by using an oscilloscope. An audio signal generator with a good sine wave output should be used for checking audio stages and a modulated r f signal generator for the r f-i f stages.

CHECKING HIGH TV VOLTAGES

Excerpt from the United States Department of Labor Occupational Guide for Television Service and Repairmen says in the job description—Checks operation of high and low voltage power supply . . . "Shorts" wires across high voltage circuit and notes resulting spark, indicating presence of high voltage supply. Note: We recommend using a high voltage probe with your V.T.V.M.

SERVICE HINTS

SPEAKER CONNECTORS—Technicians often balk at the necessity for making soldered connections in speaker replacement jobs, with the consequent inconvenience in future chassis servicing.

To avoid this nuisance, break open a discarded cannon plug from the junk box. Take out two male and two female pins; bend each speaker soldering lug into a tight loop with the needle-nose pliers, insert a female pin and solder. Use the male pins as terminals on the chassis leads and you have handy slip-connectors for your speaker.

For tight places the pins can be shortened with the diagonal cutters without impairing their efficiency.—Horace Butterworth, Washington, D. C.

REMOVING HOT TUBES—A good way to remove hot tubes from a radio or television receiver is to wear two or three rubber finger pads or stalls. These are available from most stationery stores in different sizes. Hot tubes may be replaced without burning the fingers.—Louis Grisham, Los Angeles, California.

SYLVANIA CHASSIS 508—SNOW—In the Sylvania 508 chassis, a leaky $2 \mu\text{f}$ electrolytic in the AGC circuit, C 123, will cause a snowy picture. This is because too much tuner delayed AGC is being developed. To avoid wasting time checking antenna, tuner, or tube trouble, the following check would quickly determine whether or not C 123 is leaky without taking the chassis out of the cabinet: Pull out V11, the 6AV6 in the sound section, and short pin 5 to pin 6 with a fine piece of wire. This will short the tuner AGC to ground when the tube is put back in. The snow will clear up when the 6AV6 is reinserted indicating a defective C 123.—E. R. Nelson, Buffalo, N. Y.

NOTE: In strong signal areas this condition will cause a negative picture.

DIAL CORD RESTRINGING—To facilitate dial cord restringing, it is often possible to use the old cord to pull the new one through the pulleys. Simply tie the new dial cord to one end of the old cord which is to be removed; then by drawing on the remaining free end of the old cord, the new one automatically follows around the spindles and pulleys until it is in the proper position.

If the cord is completely broken instead of merely worn and frayed, the same method applies except that one or more pulleys may have to be strung by hand.—E.L. Deschambault, R. T., Quebec, Canada.

BATTERY REPLACEMENT IN TEST EQUIPMENT—In multimeters, ohmmeters and similar equipments using penlight battery cells, the cells are often soldered directly into the instrument without the benefit of battery clips. When the cells are replaced with new ones, the heat from the soldering iron may be detrimental to the life of the cell.

To remedy this difficulty, I have found it convenient to install small battery clips of the style used in miniature electric toys or to fashion one from a large fuse clip.—Harold J. Weber, Sparta, Illinois.

TV SET HISTORY—Since a television set is an expensive piece of equipment for most people, it was found advisable to make a complete record of the set with the following notations.

Date purchased, dealers name, service contract, service calls, kind of set, model and/or serial number of set and number of chassis.

This information would also be handy when the customer wishes to trade the set in so that a fair trade-in value could be arrived at.—Donat A. Duquet, Waterville, Maine.

SYLVANIA MAGNETIC SCREW-DRIVER—I have found that the Sylvania magnetic screwdriver is one of the most useful and space saving tools that I have on my service bench or kit. In order to increase the convenience of this tool, I no longer carry the extra tips in the handle but have salvaged the permanent magnets from a couple of old speakers, one of which I have fastened above my bench. This magnet holds the spare bits nearby, making it easy to exchange and also a place to put the bit where it can be found the next time you need it. In my service kit, the other magnet is tucked into one corner where again the spare bits are handy and can be located instantly. Needless to say, I have two of these tools, one on the bench and the other in the kit.—Frank T. Kurowski, New Hartford, N. Y.

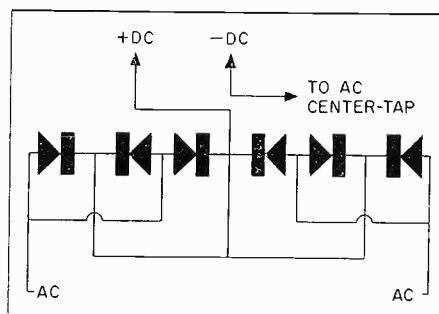
LOW VOLTAGE RECTIFIER REPLACEMENT—On one emergency call, I was faced with the problem of replacing an overloaded dry-rectifier stack in a 6 volt battery eliminator. Since there was no duplicate replacement part immediately available, I dismantled a husky 200 ma selenium rectifier and re-assembled it for use in a full-wave rectifier circuit, which the eliminator uses. I used all 6 plates; 3 plates in parallel for each leg as in the schematic shown below:

The finished unit worked well and was running cool—the set powered by the unit drew 2.5 amperes!

Note: A bolt and some extra washers and pigtailed will be needed for the new assembly.

—Jesus Ongchua, Quezon Avenue, Cebato, Mindanao, Philippine Islands.

EDITORS NOTE: Caution must be exercised in order to avoid over-loading the selenium rectifiers. The theoretical limit of the unit described is 1.2 amperes.



COLOR TV FOR THE SERVICEMAN

By G. M. Lankard
and J. S. Allen

The approval of the Color Television Standards proposed by the National Television Systems Committee has opened the way for the appearance of color receivers in significant and increasing quantities. As time passes, these receivers will require attention by the television serviceman, who must prepare himself to service color sets intelligently and ably. This is the first of a series of articles which will encompass the complete Color Television story.

It is the purpose of this article to discuss the NTSC standards as related to the production of a color video signal and it is intended to acquaint the television serviceman with the information necessary for the proper servicing of color television receivers when they become available. Black and white television has been with us for over six years now, and it will therefore be assumed that the reader has a full understanding of black and white television principles. Engi-

SYLVANIA NEWS

TECHNICAL SECTION

MAY-JUNE 1954 Vol. 21, No. 5

William O. Hamlin, Technical Editor

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neering and design data will be kept to a minimum and those portions of color television which are identical to black and white will not be fully explained.

If the reader wishes further details on the mathematical analysis of the color signal the "Proceedings of I.R.E.", October 1951 and January 1954, and "Electronics", December 1953, contain this information. The series beginning 1948 in Sylvania News contains a thorough explanation of black and white television principles and circuitry.

NTSC Standards and the Composite Color Signal

The authorization of color television broadcasting does not effect the existing black and white television service. In fact, the black and white signal should be improved since closer tolerances must be maintained by the transmitting equipment. The 6 Mc channel bandwidth will remain

the same. The picture carrier will still be located at 1.25 Mc above the lower channel limit utilizing vestigial sideband transmission; and the frequency modulated sound carrier will remain at 4.5 Mc above the picture carrier. The difference between monochrome* and color is the addition of sidebands of a suppressed color* subcarrier at 3.579545 Mc (approx. 3.58 Mc. which will be the rounded figure referred to for simplicity) above the picture carrier, and the addition of a burst sync signal* on the back porch of the horizontal sync pulse. The exact frequency has been specified to a large number of decimal places, in order to minimize interference of the color signal with the monochrome signal. The relationship between carriers for the complete 6 Mc bandwidth is pictured in Figure 1. Since the monochrome has not been changed, the black and white television viewers will receive all programs in black and white, while those who have a color receiver can receive color programs in color, and black and white programs in black and white. The system is therefore compatible.

The reproduced color picture is made up in much the same way that a child colors a printed picture, or the photographer tints a photograph. The black and white outline of the child's picture or the photograph provide the detail while the color is added to represent the original scene.

Luminance and Chrominance

The complete color picture is made up of a luminance signal and a chrominance signal.* The luminance or brightness signal provides the information for the black and white

*See Glossary Of Terms

(Continued on page 6)

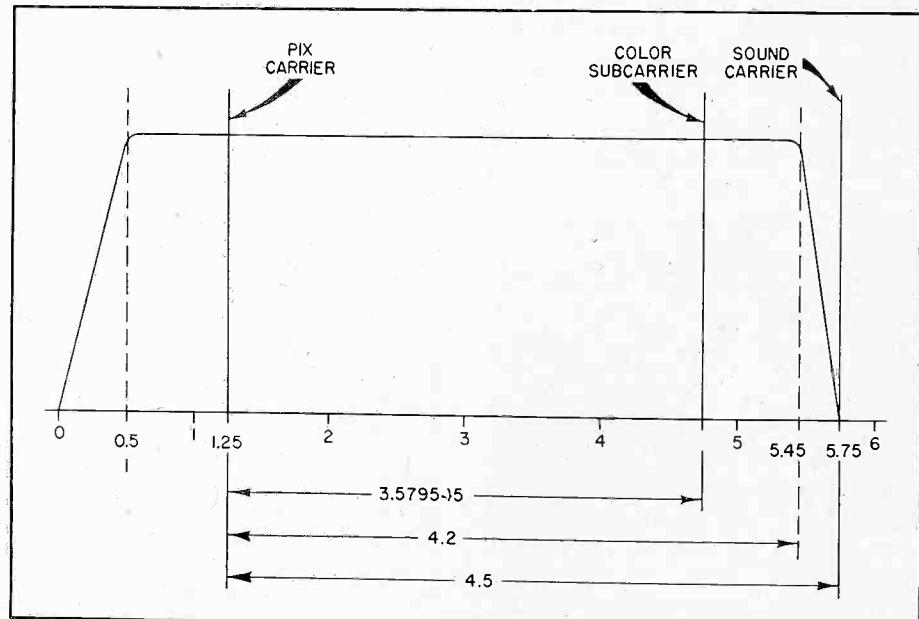


Figure 1—The complete bandwidth of a color television signal showing the relationship between carriers.

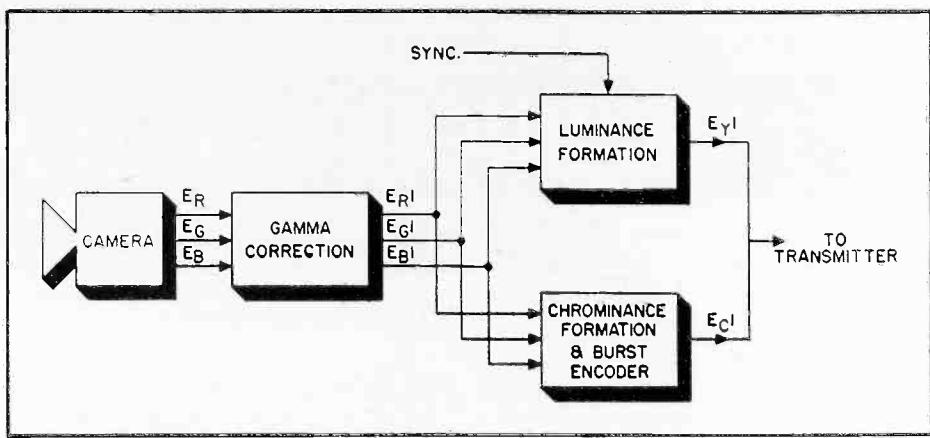


Figure 2—A block diagram of how the color television signal is formed showing both luminance and color signal channels.

(Continued from page 5)

television viewers as well as the detail for the color picture. The chrominance signal which contains both hue* and a degree of saturation* provides the information required to reproduce the large areas of the picture in their proper colors.

The luminance signal, consisting of only black to white information is called the Y signal.* It contains certain amounts of red, green and blue color which appears to the eye, when mixed together, as different shades of gray. These amounts were determined by experiment and found to yield satisfactory brightness when combined in those proportions shown in Equation 1.

Eq.1. $Y = .59G + .30R + .11B$
Since the black and white television set needs only brightness information, the above luminance signal will be used by monochrome receivers and also furnish detail for the color receiver.

The chrominance signal is somewhat more complex. Three primary colors or hues were chosen, combinations of which will produce all colors necessary for the satisfactory reproduction of the original color scene. The color television camera produces three video signals proportional to the red, blue and green content of the original scene. A block diagram of the color circuits from the camera are shown in Figure 2. These three original signals contain the three necessary elements; luminance, hue and degree of saturation. The luminance will furnish

the detail as described earlier, while the chrominance will be used to "color" the reproduced picture.

Chrominance Bandwidth

The red, green and blue signals from the color camera pass through gamma corrector amplifiers* which correct for brightness vs grid voltage non-linearity present in picture tubes. The corrected red, green and blue signals then enter the encoder, a device which converts these three signals into the chrominance signal.* Here the red, green and blue information is used to form two color video signals which are designated as I and Q. The characteristics of I and Q signals were chosen to conform to certain characteristics of human vision. It has been found that the eye cannot perceive color in fine detail but produces only brightness sensation. For medium fine detail, the eye is most responsive for orange and its complement, cyan (blue-green). This is the signal referred to as I which is bandwidth limited to 1.5 Mc and corresponds to the degree of detail which the eye can see for these colors. Positive going I reproduces orange, negative going I—cyan.

For relatively coarse detail, corresponding to 0.5 Mc video bandwidth, the eye functions as a three color device, that is, it can see all colors. Since I produces only orange and cyan, the second signal, Q, is added having a bandwidth of 0.5 Mc which produces green and its complement, magenta (reddish-purple).

Positive going Q produces magenta, negative going Q—green. The two, when properly combined with the luminance signal, will produce three color information in coarse detail (broad areas), two color information in medium detail and monochrome in fine detail. Since the luminance signal has normal video bandwidth of four Mc, we find that a signal conforming to the NTSC standards produces three color reproduction from 0 — 0.5 Mc (I & Q), two color reproduction from 0.5 — 1.5 Mc (I), and monochrome reproduction from 1.5 to 4 Mc (Y). The three bandwidths which compose the complete video signal are illustrated in Figure 3.

Chrominance Formation

The I and Q signals are applied to their respective balanced modulators together with a signal of subcarrier frequency. The subcarrier signal to the I modulator leads the subcarrier to the Q modulator by 90°. The combined output consists of subcarrier sidebands, variable in phase to determine the hue, and variable in amplitude to determine the degree of saturation. The combination of I and Q is represented in vector diagram of Figure 4. Note that this represents only one condition of hue and saturation. E_I and E_Q* may vary both in amplitude and polarity so that the resultant, E_C, may have any phase and any amplitude.

Due to the characteristics of balanced modulators, neither the carrier nor the modulating video appear at the output, but are cancelled out, leaving only the I and Q resultant sidebands.

*See Glossary Of Terms

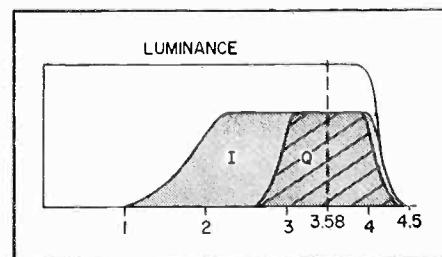


Figure 3—The three bandwidths (luminance, I, and Q) which compose the complete color video signal.

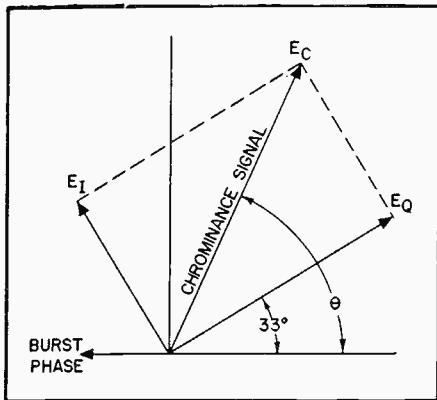


Figure 4—A vector diagram representing the phase relationship between the color reference burst (color subcarrier frequency) and the I and Q signals.

There are two important reasons for suppressing the subcarrier.

1. In amplitude modulation a great amount of power is lost in transmitting the carrier which contains no intelligence, the intelligence being carried in the sidebands. Therefore, eliminating the carrier increases the sideband power, resulting in a higher signal to noise ratio.
2. Eliminating the carrier minimizes interference which results from heterodyning the color and sound carriers (approx. 900 Kc). This beat may show up as interference on the screen of both the monochrome and color receiver.

Synchronizing Signals

The horizontal and vertical sync signals of NTSC color are similar with those of monochrome—tolerances are closer on some pulse widths and there is a slight difference in scanning rates (0.1% lower). These matters are, however, of no concern to the receiver serviceman since they in no way affect set operation. The significant departure from monochrome sync is the inclusion of a burst of approximately nine cycles of a 3.58 Mc sine wave located on the back porch of each horizontal blanking pedestal but omitted during the nine line equalizing and vertical sync pulse intervals. A photograph of NTSC sync and blanking appears in Figure 5. The exact manner in which the burst is utilized in a receiver will be dealt with in a future article.

Suffice it is to say here that the burst is used as a phase and frequency reference for a local subcarrier oscillator in the receiver in a manner similar to that in which horizontal sync pulses are used in black and white receivers.

The composite color signal consists, then, of the luminance signal (essentially a black and white signal), the sync pulses and the chrominance signal. Figure 6 shows the complete color video signal for four vertical bars, respectively green, red, blue and green. This video signal may be used to amplitude modulate the picture carrier of a conventional television transmitter in the usual manner to produce a black and white picture.

*See Glossary Of Terms

GLOSSARY OF TERMS

Brightness—The same as luminance. Variations in white light from black to bright white; in between values are shades of gray. White light as it appears in nature consists of a mixture of all colors.

Burst Sync Signal—Approximately 9 cycles of the exact subcarrier frequency used to lock in the receiver color circuits for proper color demodulation.

Chrominance—Same as color, containing the properties of hue and saturation.

Color—Called chrominance by the NTSC and is to be distinguished as a separate property (excluding brightness) in color television.

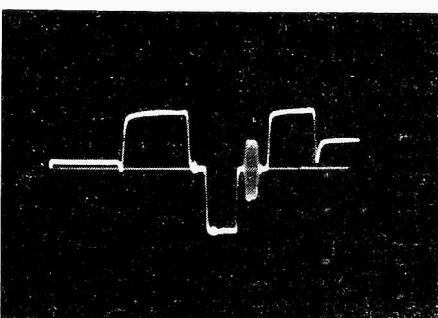


Figure 5—A photograph of a portion of the color video signal showing the horizontal blanking and sync; the burst reference signal may be seen to the right of the sync pulse. The video is in a negative going direction.

E_I—Voltage amplitude of the signal.

E_Q—Voltage amplitude of the Q signal.

Gamma Corrector—A device having high gain at low signal levels and lower gain at high signal levels. It is of interest to the serviceman only to explain how it is possible to display true brightness on the inherently non-linear picture tube.

Hue—The designation of a specific color as it appears to the eye; i.e., red, orange, blue, etc. Scientifically it may be measured in frequency or wavelength (millimicrons or angstrom units).

Luminance—Same as brightness.

Monochrome—One color. Black and white television is actually achromatic or having no color (just brightness) but in the interest of simplicity it has generally been called monochrome. It is represented by the brightness signal (Y) in color television.

NTSC—National Television Systems Committee, a group representing the major television manufacturers for the purpose of establishing television standards for the best public interest.

Saturation—Purity of a color. It is the percentage of white light mixed with a certain hue; 100% saturation is a pure color and 10% saturation would be a very diluted color or almost white.

Y Signal— Y is the symbol used for the brightness component of the picture.

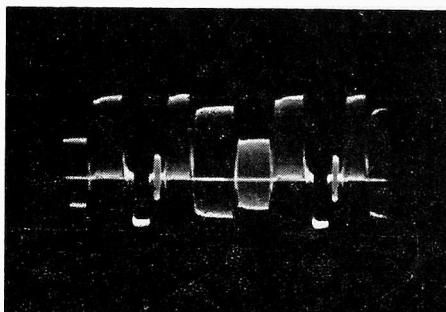


Figure 6—A Photograph of the complete color video signal as it appears when scanning four vertical bars of green, red, blue and green. Note that the video is in a negative direction.

TECH TOPICS

ION TRAP MAGNET STRENGTH

The serviceman often wonders what effect different strength ion traps have on a particular picture tube. Specifications for single field ion trap magnets for various picture tubes are determined at the factory by the anode potential and the angle of bend or lens tilt in the gun. From these factors a table can be devised to be used as a general guide for most of the newer picture tubes, as these tubes usually have about the same angle of bend in the gun. Also, a continuous check is maintained at the factory to control the spread of optimum magnet strength from tube to tube of a given type. The general guide for ion trap replacement given in Table I should be useful to the serviceman if the considerations given below are taken into account.

TABLE I

Anode Voltage	Ion Trap Strength
14 KV	30 Gausses
16 KV	35 Gausses
18 KV	40 Gausses
20 KV	40 Gausses

Deterioration of a magnet with age, shunting of its field or other factors may very well result in a dim picture. It would be a good idea to replace the

magnet with a new one if the old magnet does not seem to brighten the picture in a normal manner. Try a new magnet before pulling the picture tube or applying a brightener, as it may save some time if it is found that the tube is not at fault.

Replacement by and proper adjustment of a magnet which is higher than the recommended value will have no harmful effect on the picture tube, and it might result in a brighter picture. However, proper adjustment should follow the procedure as outlined in the article "Ion Trap Magnets" by G. E. Fogg, published in the March 1953 SYLVANIA NEWS, Technical Section.

A magnet which is too strong will result in either an adjustment which is too close to the tube base or a situation where a brightness peak cannot be obtained at any point along the picture tube neck.

If you are not sure that the proper magnet is being used, an adjustable ion trap magnet will be a help. These magnets can be varied from about 32 gauss to 55 gauss. To adjust a variable magnet, start at a low magnet strength and locate the magnet for the brightest picture. Then increase the magnetic strength in steps, each time readjusting its position on the picture tube neck. Each readjustment should result in a slightly brighter picture. Eventually a point will be reached where there is no longer an increase in brightness with increasing magnet strength. This means that there is sufficient magnetism for best ion trap operation. Now you can try substituting fixed ion traps for the variable unit to find one which gives equal picture brightness, thus saving the variable magnet for testing on other sets. Bear in mind that you should leave the brightness control in the same position when changing magnets and adjustments, so that changes in brightness can be detected.

—W.O.H.

NEW CHARTS FOR SYLVANIA TUBE TESTER

New Roll Charts are now available to all owners of Sylvania 139/140 and 219/220 Tube Testers. Copies may be obtained at \$1.00 each from Sylvania Electric Products Inc., 1221 West Third Street, Williamsport, Pennsylvania. Attn: Mr. Jack Mintzer.

Pc numbers of the new Charts are as follows:

139/140 — PC 15845J
219/220 — PC 18325G

Between revisions, supplemental settings are published in SYLVANIA NEWS as soon as available.

Note:—Tubes added to new Tube Tester Roll Chart

6AM8	6CS6
6BX7	12BN6
6CF6	1247
6CM6	1AX2

EXTRA TECHNICAL MANUAL BINDERS AVAILABLE

Extra Technical Manual Binders have now been made available to you. The Sylvania Technical Manual supplement service, which continues to bring you data on new receiving and picture tubes, has filled the single binder of the Ninth Edition to near capacity so that an additional binder is desired by many Manual owners.

Order your extra binder with a remittance of 75c from:

Sylvania Electric Products Inc.
Central Advertising Distribution
Department
1100 Main Street
Buffalo 9, New York.

SERVICE HINT

MEISSNER 8C FM TUNER—Excessive warm-up drift is caused by the ceramic capacitor on the fm detector transformer. The trouble can be cleared up by replacing the 70 μf ceramic capacitor on the top of the detector coil with a 68 μf , 5% silver mica capacitor.—Harold J. Weber, Sparta, Illinois.

SYLVANIA NEWS

OCTOBER 1954

RADIO
TELEVISION
SERVICE

WITH SYLVANIA RADIO
AND TV TUBES



C. J. Luten, editor

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Sylvania Electric Products Inc.

Vol. 21, No. 8

SYLVANIA LAUNCHES ATTACK ON CALLBACKS

In an effort to put an end to the thankless, profitless callback evil to which the service dealers of the industry have been subjected, Sylvania has announced the development of a new line of receiving tubes. This new line, by its very nature, strikes the callback evil right at its heart. These new tubes are not only sounder and sturdier, but they represent the most important step yet taken in upgrading recognized quality standards. Use of the newly designed Sylvania receiving tubes will convince the dealer of their long life, dependable performance, and trouble-free operation. And most important, he will save time and money too.

Leader of the new line is the newly engineered 5U4GB. Incorporating many important developments in receiving tube design, the 5U4GB features the wafer stem construction, a Sylvania development already hailed as an outstanding achievement in the manufacture of receiving tubes. Outstanding among the many important advantages offered by the wafer stem is the elimination of electrolysis in the base of the tube which is made possible by the increased spacing between the leads. Equally significant is the stronger mount construction the wafer stem provides. The mount is supported in at least three places.

A reduction of heat, an all important factor in the operation of a receiving tube, will improve not only the operation of the tube but also its life expectancy. The heavier, shorter leads in the 5U4GB provide better heat dissipation. The heavier leads also reduce the possibility of shorts inside the base of the tube.

Another important development in the 5U4GB is its new bulb design which allows almost twice as much space between the top of the bulb and the top of the mount than had been available in its prototype. This newly shaped bulb sharply reduces bulb punctures caused by electron bombardment.

The most important characteristic of the 5U4GB is its higher ratings—

the dealer's assurance of superior performance in all of this tube type's present day critical applications. Sylvania's new 5U4GB is a sounder, stronger tube.

Another important innovation in the Sylvania 5U4GB is the addition of a bottom mica which provides extra strength and more accurate filament alignment. This new feature goes a long way toward eliminating arcing and shorts.

The early burnouts of older tubes, which often necessitated costly callbacks, have been further prevented by a new controlled filament coating which will substantially extend tube life.

Sylvania, over the years, has pioneered many new and successful innovations in vacuum tube design such as the "lock in" and the "subminiature." Accepting its responsibilities to the service industry as a leader in the field of electronics, Sylvania is now presenting this line of new and completely redesigned tubes as the solution to an industry wide problem.

The company has assured its customers that the 5U4GB and the

recently announced 6BQ6GTA are not the limit of the ammunition designed to wage war on callbacks. Soon to be available is the redesigned 6SN7GTA, which itself will be followed by many more types of superior quality and design.

To introduce its new line, Sylvania has prepared a handsome new *yellow and black carton* to serve as the *calling card of quality tubes*. The new carton will identify its contents as a product of outstanding quality, a product specifically designed to attack expensive dealer callbacks.

As a further signature of quality, the new types will be base-stamped in yellow.

Sylvania recognizes the seriousness of the dealer callback problem. It is prepared to lead the industry in waging an all-out war on the callback enemy with new standards of quality. Sylvania is aware that this problem is not one which can be solved by an occasional, half-hearted effort. Complete success in this venture can result only from ingenuity, vigilance and persistence. These qualities dealers have long associated with the Sylvania name.



Sylvania new 5U4GB has design features to help combat the callback problem for service dealers. The new 5U4GB comes in the new attractive yellow and black carton shown above.

BEAT THE CLOCK HELPS YOU SELL SYLVANIA "SILVER SCREEN 85" PICTURE TUBE

Every Saturday during October as well as November 6, 13, and 20, Sylvania's popular television show *Beat the Clock* will promote the sensational new *Silver Screen 85* picture tube to your customers.

Commercials such as the one shown below will back up your sales of the *Silver Screen 85* by creating a demand for its superior performance. A glance at the list of stations shown at right will indicate the enormous coverage *Beat the Clock* has and tell you exactly on what station your local prospects will view these hard-hitting sales messages.

Here's a sample:

Here are the three reasons why *only Sylvania's* new *Silver Screen 85* Picture Tube can give your present TV set perfect vision.

In the ordinary picture tube, the electron gun hits the phosphor atoms on the tube face with an uneven beam, making the picture clear in the center but fuzzy on the edges.

But the precision-focus electron gun in *Sylvania's* new *Silver Screen 85*, shoots a perfectly balanced electron beam over the entire tube face, for a picture as crystal clear on the edges as in the center.

In the ordinary picture tube, tiny phosphor atoms glow like this, when bombarded by the electron beam.

But, in *Sylvania's Silver Screen 85*, the phosphor atoms are joined by millions of silver activated atoms which increase the light intensity for a far sharper picture.

In the ordinary picture tube, nearly half the light is lost through the back and sides of the tube.

But in the *Sylvania Silver Screen 85*, a coating of aluminum holds and reflects that light like the reflector behind an auto headlight, to give seven times more picture contrast.

These are just a few of the reasons why *no* picture tube can equal the remarkable performance of the *Silver Screen 85*!

And this fully guaranteed picture tube has this name on the face as your assurance of a genuine *Sylvania Silver Screen 85*.

For the *free* and fact-filled booklet about the wonderful *Silver Screen 85*, write to *Sylvania*, (address).

Ask your TV service dealer for *Sylvania's* new *Silver Screen 85*!

BEAT THE CLOCK STATION LIST

State	City	Station	Local Time and Day
N. M.	Albuquerque	KGGM-TV	7:30- 8:00 PM, Sat.
Tex.	Amarillo	KFDA-TV	6:30- 7:00 PM, Sat.
Ia.	Ames	WOI-TV	6:30- 7:00 PM, Sat.
Ga.	Atlanta	WAGA-TV	7:30- 8:00 PM, Sat.
Ga.	Augusta	WRDW-TV	7:30- 8:00 PM, Sat.
Tex.	Austin	KTBC-TV	6:30- 7:00 PM, Sat.
Md.	Baltimore	WMAR-TV	7:30- 8:00 PM, Sat.
Ala.	Birmingham	WBRC-TV	6:30- 7:00 PM, Sat.
Mass.	Boston	WNAC-TV	5:00- 5:30 PM, Sat.
N. Y.	Buffalo	WBEN-TV	5:30- 6:00 PM, Sat.
Ia.	Cedar Rapids	WMT-TV	6:30- 7:00 PM, Sat.
N. C.	Charlotte	WBTV	6:30- 7:00 PM, Sat.
Ill.	Chicago	WBBM-TV	6:30- 7:00 PM, Sat.
Ohio	Cincinnati	WKRC-TV	7:30- 8:00 PM, Sat.
Ohio	Cleveland	WEWS	7:30- 8:00 PM, Sat.
Colo.	Colorado Springs	KKTV	7:30- 8:00 PM, Sat.
Ohio	Columbus	WBNS-TV	7:30- 8:00 PM, Sat.
Tex.	Dallas	KRLD-TV	6:30- 7:00 PM, Sat.
Ohio	Dayton	WHIO-TV	7:30- 8:00 PM, Sat.
Colo.	Denver	KLZ-TV	8:30- 9:00 PM, Sat.
Mich.	Detroit	WJBK-TV	7:30- 8:00 PM, Sat.
Tex.	El Paso	KRQD-TV	8:30- 9:00 PM, Sat.
Pa.	Erie	WSEE-TV	7:30- 8:00 PM, Sat.
Calif.	Fresno	KJEO-TV	7:30- 8:00 PM, Tues.
Tex.	Galveston - Houston	KGUL-TV	6:30- 7:00 PM, Sat.
Wis.	Green Bay	WBAY-TV	6:30- 7:00 PM, Sat.
N. C.	Greensboro	WFMY-TV	6:30- 7:00 PM, Sat.
Conn.	Hartford - New Britain	WKNB-TV	7:30- 8:00 PM, Sat.
Mass.	Holyoke	WHYN-TV	7:30- 8:00 PM, Sat.
Kan.	Hutchinson	KTVH	6:30- 7:00 PM, Sat.
Ind.	Indianapolis	WFBM-TV	6:30- 7:00 PM, Sat.
Fla.	Jacksonville	WMBR-TV	7:30- 8:00 PM, Sat.
Pa.	Johnstown	WJAC-TV	6:30- 7:00 PM, Thurs.
Mich.	Kalamazoo	WKZO-TV	7:30- 8:00 PM, Sat.
Mo.	Kansas City	WHLB-TV	6:30- 7:00 PM, Sat.
Tenn.	Knoxville	WTSK-TV	7:30- 8:00 PM, Sat.
Pa.	Lancaster	WGAL-TV	2:30- 3:00 PM, Sun.
Calif.	Los Angeles	KNXT	6:30- 7:00 PM, Sat.
Ky.	Louisville	WHAS-TV	5:30- 6:00 PM, Sat.
Tex.	Lubbock	KDUB-TV	6:30- 7:00 PM, Sat.
Va.	Lynchburg	WLVA-TV	7:30- 8:00 PM, Sat.
Tenn.	Memphis	WHBQ-TV	6:30- 7:00 PM, Sat.
Wis.	Milwaukee	WCAN-TV	6:30- 7:00 PM, Sat.
Minn.	Minneapolis	WCCO-TV	6:30- 7:00 PM, Sat.
Ala.	Mobile	WALA-TV	6:00- 6:30 PM, Sat.
La.	Monroe	KNOE-TV	6:30- 7:00 PM, Sat.
Ala.	Montgomery	WCOV-TV	6:30- 7:00 PM, Sat.
Tenn.	Nashville	WLAC-TV	6:30- 7:00 PM, Sat.
La.	New Orleans	WJMR-TV	6:30- 7:00 PM, Sat.
N. Y.	New York	WCBS-TV	7:30- 8:00 PM, Sat.
Va.	Norfolk	WTAR-TV	7:30- 8:00 PM, Sat.
Oklahoma	Oklahoma City	KWTV	6:30- 7:00 PM, Sat.
Neb.	Omaha	KMTV	6:30- 7:00 PM, Sat.
Ill.	Peoria	WTVH-TV	6:30- 7:00 PM, Sat.
Pa.	Philadelphia	WCAU-TV	7:30- 8:00 PM, Sat.
Ariz.	Phoenix	KPHO-TV	9:00- 9:30 PM, Sat.
Ark.	Pine Bluff	KATV	6:30- 7:00 PM, Sat.
Pa.	Pittsburgh	WDTV	4:00- 4:30 PM, Sat.
Me.	Portland	WGAT-TV	7:30- 8:00 PM, Sat.
Ore.	Portland	KOIN-TV	6:30- 7:00 PM, Sat.
N. C.	Raleigh	WNAO-TV	10:00-10:30 PM, Sun.
Pa.	Reading	WHUM-TV	7:30- 8:00 PM, Sat.
N. Y.	Rochester	WHEC-TV	7:30- 8:00 PM, Sat.
Ill.	Rock Island	WHBF-TV	6:30- 7:00 PM, Sat.
Mo.	St. Louis	KWKT-TV	6:30- 7:00 PM, Sat.
Utah	Salt Lake City	KSL-TV	5:30- 6:00 PM, Sat.
Tex.	San Antonio	KGBS-TV	6:30- 7:00 PM, Sat.
Calif.	San Diego	KFMB-TV	10:30-11:00 PM, Thurs.
Calif.	San Francisco	KPIX	6:30- 7:00 PM, Sat.
Pa.	Scranton	WGBI-TV	7:30- 8:00 PM, Sat.
Ia.	Sioux City	KVT	6:30- 7:00 PM, Sat.
Ind.	South Bend	WSBT-TV	6:30- 7:00 PM, Sat.
Wash.	Spokane	KXLY-TV	7:30- 8:00 PM, Sat.
Mo.	Springfield	KTTS-TV	6:30- 7:00 PM, Sat.
N. Y.	Syracuse	WHEN-TV	7:30- 8:00 PM, Sat.
Wash.	Tacoma - Seattle	KTNT	7:30- 8:00 PM, Sat.
Ohio	Toledo	WSPD-TV	7:30- 8:00 PM, Sat.
D. C.	Washington	WTOP-TV	7:30- 8:00 PM, Sat.
Ohio	Youngstown	WKBN-TV	7:30- 8:00 PM, Sat.
Hawaii	Honolulu	KGMB-TV	7:30- 8:00 PM, Sat.

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For the *free* and fact-filled booklet about the wonderful *Silver Screen 85*, write to *Sylvania*, (address).

Ask your TV service dealer for *Sylvania's* new *Silver Screen 85*!

BEAT THE CLOCK STATION LIST

State	City	Station	Local Time and Day
N. M.	Albuquerque	KCCM-TV	7:30- 8:00 PM, Sat.
Tex.	Amarillo	KFDA-TV	6:30- 7:00 PM, Sat.
Ia.	Ames	WOI-TV	6:30- 7:00 PM, Sat.
Ga.	Atlanta	WAGA-TV	7:30- 8:00 PM, Sat.
Ga.	Augusta	WRDW-TV	7:30- 8:00 PM, Sat.
Tex.	Austin	KTBC-TV	6:30- 7:00 PM, Sat.
Md.	Baltimore	WMAR-TV	7:30- 8:00 PM, Sat.
Ala.	Birmingham	WBRC-TV	6:30- 7:00 PM, Sat.
Mass.	Boston	WNAC-TV	5:00- 5:30 PM, Sat.
N. Y.	Buffalo	WBEN-TV	5:30- 6:00 PM, Sat.
Ia.	Cedar Rapids	WMT-TV	6:30- 7:00 PM, Sat.
N. C.	Charlotte	WBTV	6:30- 7:00 PM, Sat.
Ill.	Chicago	WBMM-TV	6:30- 7:00 PM, Sat.
Ohio	Cincinnati	WKRC-TV	7:30- 8:00 PM, Sat.
Ohio	Cleveland	WEWS	7:30- 8:00 PM, Sat.
Colo.	Colorado Springs	KKTV	7:30- 8:00 PM, Sat.
Ohio	Columbus	WBNS-TV	7:30- 8:00 PM, Sat.
Tex.	Dallas	KRLD-TV	6:30- 7:00 PM, Sat.
Ohio	Dayton	WHIO-TV	7:30- 8:00 PM, Sat.
Colo.	Denver	KLZ-TV	8:30- 9:00 PM, Sat.
Mich.	Detroit	WJBK-TV	7:30- 8:00 PM, Sat.
Tex.	El Paso	KROD-TV	8:30- 9:00 PM, Sat.
Pa.	Erie	WSEE-TV	7:30- 8:00 PM, Sat.
Calif.	Fresno	KJEO-TV	7:30- 8:00 PM, Tues.
Tex.	Galveston - Houston	KGUL-TV	6:30- 7:00 PM, Sat.
Wis.	Green Bay	WBAY-TV	6:30- 7:00 PM, Sat.
N. C.	Greensboro	WFMY-TV	6:30- 7:00 PM, Sat.
Conn.	Hartford - New Britain	WKNB-TV	7:30- 8:00 PM, Sat.
Mass.	Holyoke	WHYN-TV	7:30- 8:00 PM, Sat.
Kan.	Hutchinson	KTVH	6:30- 7:00 PM, Sat.
Ind.	Indianapolis	WFBM-TV	6:30- 7:00 PM, Sat.
Fla.	Jacksonville	WMBR-TV	7:30- 8:00 PM, Sat.
Pa.	Johnstown	WJAC-TV	6:30- 7:00 PM, Thurs.
Mich.	Kalamazoo	WKZO-TV	7:30- 8:00 PM, Sat.
Mo.	Kansas City	WHB-TV	6:30- 7:00 PM, Sat.
Tenn.	Knoxville	WTSK-TV	7:30- 8:00 PM, Sat.
Pa.	Lancaster	WGAL-TV	2:30- 3:00 PM, Sun.
Calif.	Los Angeles	KNXT	6:30- 7:00 PM, Sat.
Ky.	Louisville	WHAS-TV	5:30- 6:00 PM, Sat.
Tex.	Lubbock	KDUB-TV	6:30- 7:00 PM, Sat.
Va.	Lynchburg	WLVA-TV	7:30- 8:00 PM, Sat.
Tenn.	Memphis	WHBQ-TV	6:30- 7:00 PM, Sat.
Wis.	Milwaukee	WCAN-TV	6:30- 7:00 PM, Sat.
Minn.	Minneapolis	WCCO-TV	6:30- 7:00 PM, Sat.
Ala.	Mobile	WALA-TV	6:00- 6:30 PM, Sat.
La.	Monroe	KNOE-TV	6:30- 7:00 PM, Sat.
Ala.	Montgomery	WCOV-TV	6:30- 7:00 PM, Sat.
Tenn.	Nashville	WLAC-TV	6:30- 7:00 PM, Sat.
La.	New Orleans	WJMR-TV	6:30- 7:00 PM, Sat.
N. Y.	New York	WCBS-TV	7:30- 8:00 PM, Sat.
Va.	Norfolk	WTAR-TV	7:30- 8:00 PM, Sat.
Oklahoma	Oklahoma City	KWTV	6:30- 7:00 PM, Sat.
Neb.	Omaha	KMTV	6:30- 7:00 PM, Sat.
Ill.	Peoria	WTvh-TV	6:30- 7:00 PM, Sat.
Pa.	Philadelphia	WCAU-TV	7:30- 8:00 PM, Sat.
Ariz.	Phoenix	KPHO-TV	9:00- 9:30 PM, Sat.
Ark.	Pine Bluff	KATV	6:30- 7:00 PM, Sat.
Pa.	Pittsburgh	WDTV	4:00- 4:30 PM, Sat.
Me.	Portland	WGAT-TV	7:30- 8:00 PM, Sat.
Ore.	Portland	KOIN-TV	6:30- 7:00 PM, Sat.
N. C.	Raleigh	WNAO-TV	10:00-10:30 PM, Sun.
Pa.	Reading	WHUM-TV	7:30- 8:00 PM, Sat.
N. Y.	Rochester	WHEC-TV	7:30- 8:00 PM, Sat.
Ill.	Rock Island	WHBF-TV	6:30- 7:00 PM, Sat.
Mo.	St. Louis	KWK-TV	6:30- 7:00 PM, Sat.
Utah	Salt Lake City	KSL-TV	5:30- 6:00 PM, Sat.
Tex.	San Antonio	KGBS-TV	6:30- 7:00 PM, Sat.
Calif.	San Diego	KFMB-TV	10:30-11:00 PM, Thurs.
Calif.	San Francisco	KPIX	6:30- 7:00 PM, Sat.
Pa.	Scranton	WGBI-TV	7:30- 8:00 PM, Sat.
Ia.	Sioux City	KVT	6:30- 7:00 PM, Sat.
Ind.	South Bend	WSBT-TV	6:30- 7:00 PM, Sat.
Wash.	Spokane	KXLY-TV	7:30- 8:00 PM, Sat.
Mo.	Springfield	KTTS-TV	6:30- 7:00 PM, Sat.
N. Y.	Syracuse	WHEN-TV	7:30- 8:00 PM, Sat.
Wash.	Tacoma - Seattle	KTNT	7:30- 8:00 PM, Sat.
Ohio	Toledo	WSPD-TV	7:30- 8:00 PM, Sat.
D. C.	Washington	WTOP-TV	7:30- 8:00 PM, Sat.
Ohio	Youngstown	WKBN-TV	7:30- 8:00 PM, Sat.
Hawaii	Honolulu	KGMB-TV	7:30- 8:00 PM, Sat.

SYLVANIA DISTRIBUTOR ZOBRIST PROMOTES

And that's putting it mildly. The Herb E. Zobrist Co., 2121 Westlake Ave., Seattle, Washington, climaxed a sales promotion recently with the jamboree which over 250 people attended.

The goings-on were held at the O. O. Denny Recreation Park where visitors enjoyed games, prizes and food. Among the prizes given that day was "Miss Sylvania", a 15 foot Reinell deluxe boat and motor. "Miss Sylvania" was made especially for the big contest put on by the Herb E.

Zobrist Company during the summer months. Chances on the boat were given out to the dealers against their purchases. The winner and proud new owner of *Miss Sylvania* is Andy Anderson of Laurelhurst TV, Seattle, Washington.

Second prize was a \$150 portable radio which was won by the Labrum Brothers, South Park Electric Company. Northwest TV stars Bill and Cheri Corcoran, had charge of the drawing for prizes.

New Home For All-State

Construction is now underway at Ross and Fairmount Avenues on the new home for All-State Distributing Company's Electronic Supply Firm. The building, when completely remodeled with an entire new front and interior, will represent an improvement of approximately \$85,000. Floor space will aggregate about 6000 feet.

Now in its 15th year, All-State—a Sylvania Distributor—has grown slowly but steadily, serving both commercial and industrial fields, and is now ranked as one of the leading wholesale distributors of electronic equipment in the Southwest.

NEW ROLL CHARTS KEEP TUBE TESTERS UP-TO-DATE

As a service to Sylvania customers, the Company has announced a plan which insures the purchasers of 219/220 Tube Testers of receiving all of the necessary up-to-date information on new settings and new tube types.

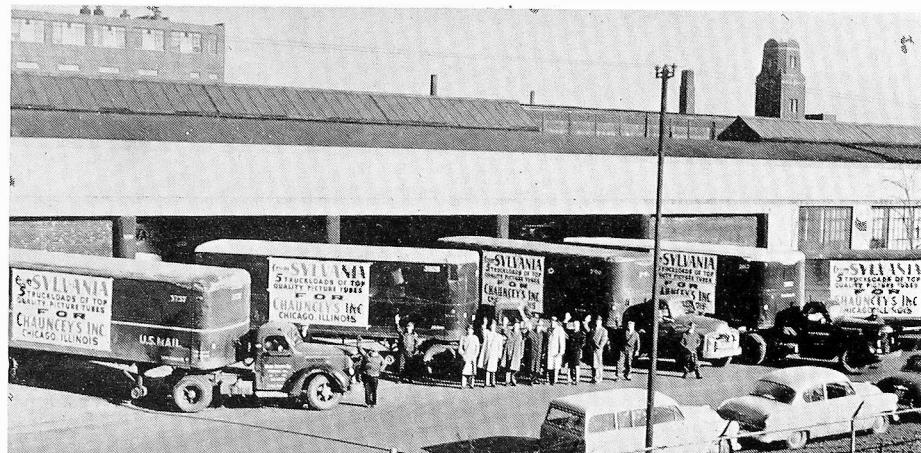
Under the new program which became effective June 1, 1954, Sylvania is mailing a roll chart, free of charge, to each new purchaser of a 219/220 Tube Tester. Purchasers are reminded, however, that in order to receive this service, they must mail in their warranty card to Sylvania Electric Products Inc., 1292 Niagara Street, Buffalo 7, New York.

Because it lists tube tester settings for nearly every Special Purpose Tube and Receiving Tube type currently on the market, this handy roll chart is an indispensable companion piece to the 219/220 Tube Tester.

This forward looking plan offers further proof of Sylvania's unending effort to serve its service dealer customers in every conceivable manner.



One of Sylvania's distributors in Michigan with truck delivery service extending 150 miles into the northernmost parts of the state, Western Electronic Supply Company is a staunch Sylvania booster and in its second year of operation. Shown in front of his store (also note the well-traveled truck), Forrest J. Hall (right), alongside Harry Barrett and Carl Butler.



Chauncey's, Inc. of Chicago, certainly believes in giving its service dealer customers the best possible service. Chauncey's keeps a king-size stock of Sylvania television picture tubes, as anyone can see from the above picture. This photograph documents a delivery of five truckloads of Sylvania television tubes for Chauncey's. On hand for this occasion are (left to right): the two truck drivers, J. P. Driscoll of Sylvania, Ken Starkey of Chauncey's, A. T. Millea, Warehouse Mgr. of Sylvania, Owner Paul Chauncey, R. L. McNelis of Sylvania, Gene Butcher of Chauncey's, T. A. Napp of Sylvania and other drivers.

NEW SYLVANIA TUBE DESIGNS FOR '54

SYLVANIA NEWS

TECHNICAL SECTION

OCTOBER 1954 Vol. 21, No. 8

William O. Hamlin, Technical Editor

This information in Sylvania News is furnished without
assuming any obligations

The television set, because it has become a common household appliance, is expected to give reliable and continuous performance, without countless repairs or adjustments. It has been estimated that the average television receiver is operated over five hours per day, which demonstrates the enormity of the problem.

Many failures in receivers are often accelerated by the high temperatures generated. The average set may continuously dissipate 125 to 200 watts of heat while operating, subjecting the tubes to high temperatures with the higher dissipation types bearing the greater load. Also, sweep tubes may be abused by misadjustment of receiver controls, causing shortened life. As a result of these factors,

Sylvania Electric has continually put these tubes under rigid scrutiny, in an effort to improve them.

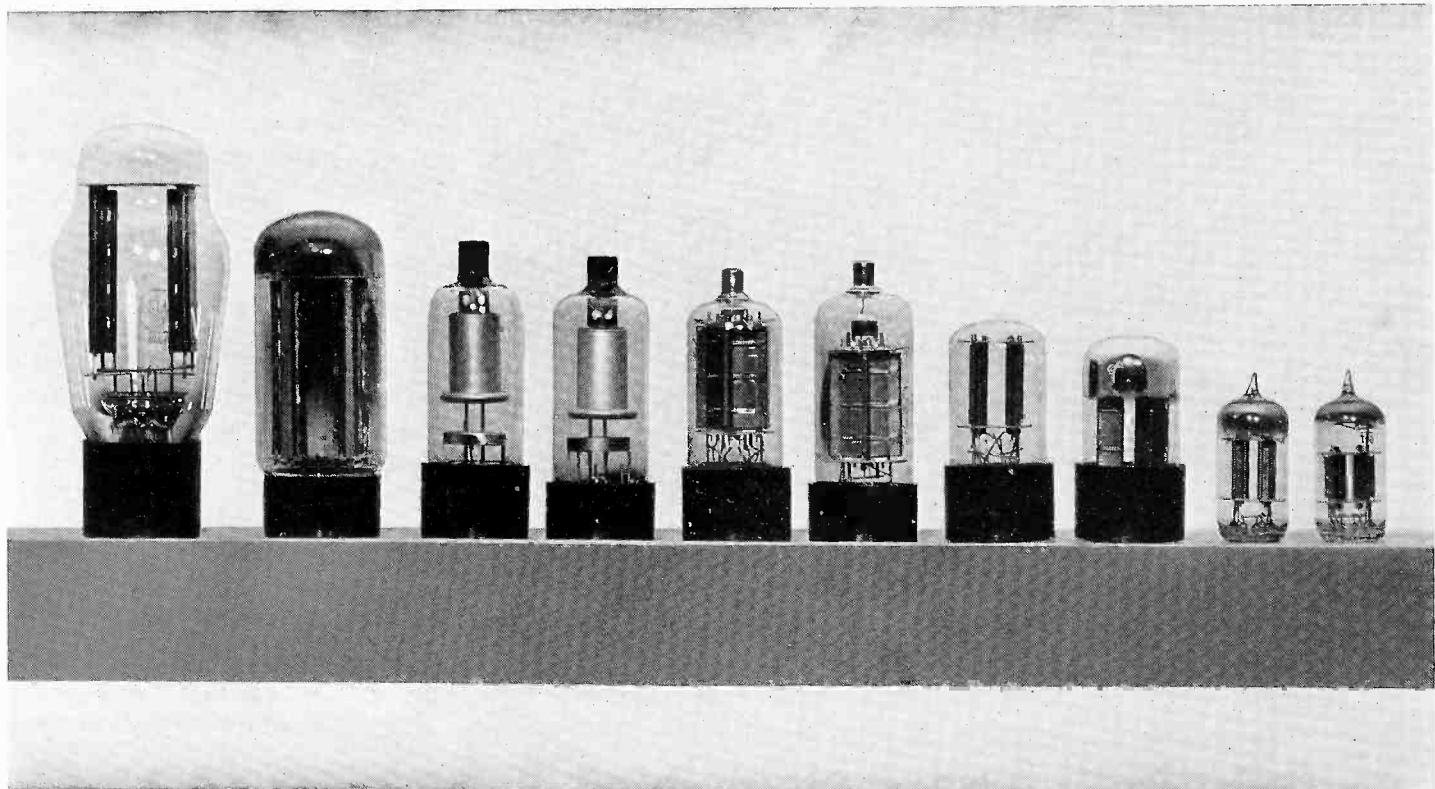
Sylvania's "Acceptance Quality Laboratory" continually operates tubes in television receivers; periodically the engineers in charge check set operation and tube performance. In addition, tube applications in television circuits are studied by the Sylvania "Commercial Engineering Laboratory" to determine if tubes are being operated within their ratings, and what tube improvements are necessary to meet the improved performance desired by industry and the public.

To meet the continuous demand of television for larger screens and better performance, Sylvania has now intro-

duced a new series of improved tubes, including three brand new types. These new tubes are generally interchangeable with the old, so that you may benefit from the Sylvania research and engineering without having to make circuit changes.

Using the improved Sylvania receiving tubes in a television receiver, along with the Sylvania "Silver Screen 85" picture tube will give the finest television performance possible today, and thereby increase customer satisfaction.

This issue of SYLVANIA NEWS is devoted to a discussion of these types, which will not only familiarize you with them, but also help you sell these high quality Sylvania tubes.



Sylvania television tubes, old and improved types reading from left to right they are: 5U4G and 5U4GB, 1B3GT (old) and 1B3GT (new), 6BQ6GT and 6BQ6GTA, 6SN7GT and 6SN7GTA, 12AU7 and 12AU7A. Details on the improved 1B3GT and 6SN7GTA will be given in a future issue.

THE NEW SYLVANIA 6BQ6GTA HORIZONTAL OUTPUT TUBE

The new Sylvania Type 6BQ6GTA horizontal output tube, for improved performance in flyback circuits, is directly interchangeable with the older 6BQ6GT. The 6BQ6GT was developed when 15 and 17 inch television screens were the vogue, but the larger deflection power needed by the bigger screen receivers has taxed the capabilities of this tube to the extreme limits of its ratings. Sylvania tube design engineers developed the 6BQ6GTA which will ease the strain in the horizontal output stage and allow more conservative tube operation.

The application requirements for this tube are very stringent. Not only must it operate at high temperatures, but also it must withstand high peak pulses—the flyback voltage on the output tube plate may be as high as 6000 volts.

Special construction and special materials are used in all parts of the tube, for the 6BQ6GTA to meet these requirements. Also, extra care is exercised in manufacturing, along with

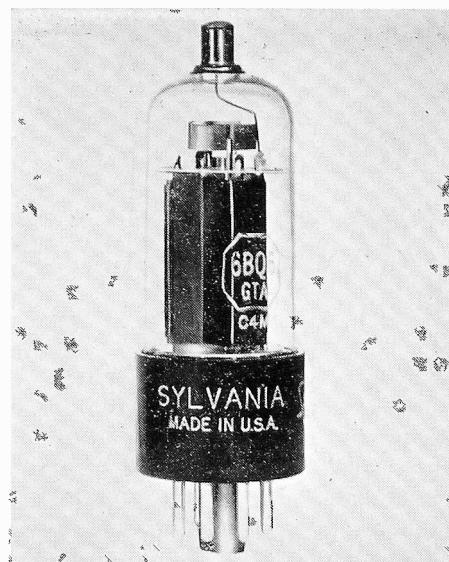
certain processing improvements.

Rigid inspections and rigorous static and dynamic life testing of Sylvania tubes are carried out in the quality testing departments, to insure that all Sylvania tubes are of the highest quality. The result is longer television receiver operation.

There are many construction improvements incorporated in the new 6BQ6GTA that give extra toughness required to meet the heavier power requirements in modern television circuits.

Wafer stem* construction is used which has several advantages. First, the base leads are heavier and shorter, thereby providing easier conduction of heat away from the tube elements, resulting in cooler operation. Second, the tube mount is closer to the base, leaving more room at the top for plate cap lead and grid heat radiator. This not only allows room for a large grid

*"Stem" is the term commonly used to designate the glass and base lead assembly at the bottom of the bulb. See Figure 1.



heat radiator, but also gives greater clearance between radiator and top-cap lead, which eliminates arcing between them. The extra clearance also reduces electron bombardment of the glass on top of the bulb. Third, the larger space between lead-in wires reduces glass electrolysis that results from the high potentials and high temperature (see Figure 1). Glass electrolysis is chemical decomposition which, in an advanced state, will allow atmosphere to seep into the high vacuum inside the bulb. It will eventually have a catastrophic effect on tube operation.

High velocity electron bombardment also has a detrimental effect on vacuum tube glass, and eventually may cause vacuum leakage. It is re-

(Continued to page 8)

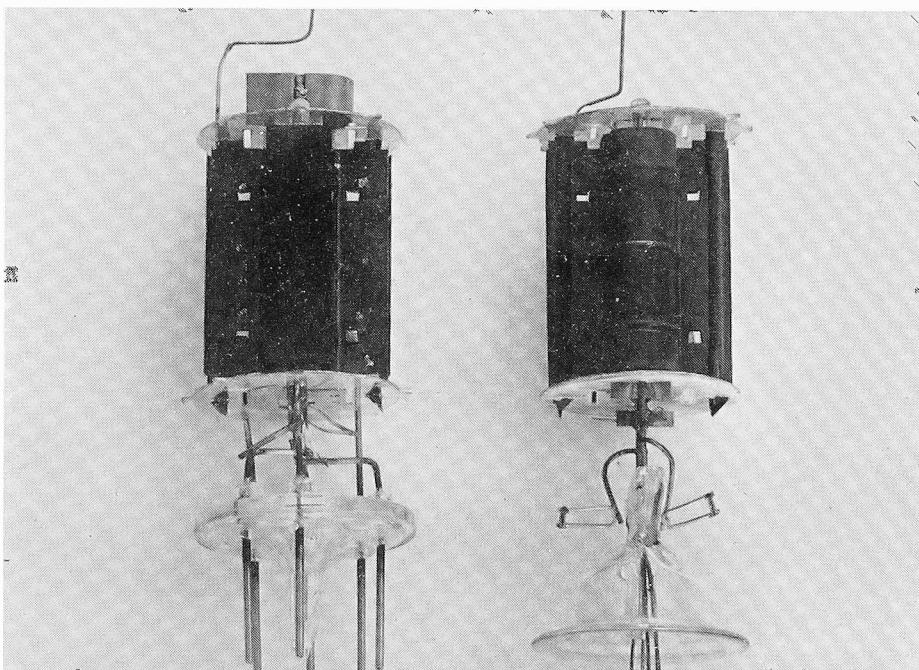


FIGURE 1

Tube mount and stem for the Sylvania Types 6BQ6GT, on the right, and 6BQ6GTA, on the left. The large grid heat radiator over the top mica and folded plate edges are easily seen on the 6BQ6GTA.

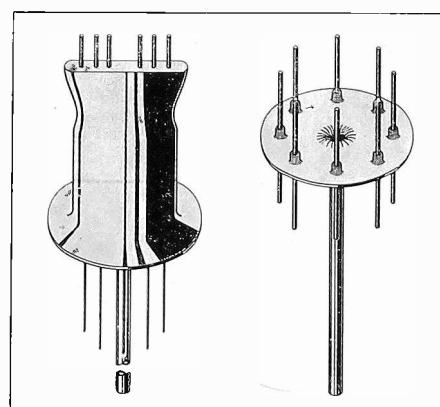


FIGURE 2

Wafer stem construction is shown on the right, the old press stem construction on the left. It is readily seen that the wafer stem leads are farther apart which (coupled with cooler operation resulting from heavier, shorter leads) reduces glass electrolysis and arcing.

Sylvania's New High Current 5U4GB

Sylvania has now developed a truly long-life service-designed tube to relieve the strain on one of the most over-taxed sockets in large screen television receivers. The type 5U4GB high current full-wave rectifier may replace the Type 5U4G, with no wiring changes. The improved tube, along with the new attractive yellow and black Sylvania carton, is shown in Figure 1.

By using radically new and better structural design, Sylvania tube design engineers were able to make a receiving tube full-wave rectifier which has higher ratings, better heat dissipation and lower tube drop than the 5U4G without changing the filament requirements (see Figure 2).

The new 5U4GB has a large T-12 bulb which is narrower ($1\frac{1}{16}$ "') than the 5U4G ($2\frac{1}{16}$ ") in its largest dimension. Also, the seated height of the

5U4GB is shorter, $4\frac{3}{16}$ "', as compared to $4\frac{3}{4}$ " for the older type (see Figure 3). Yet, the heat dissipation is improved, because of the wafer stem and new plate design.

Even though a T-12 bulb was used, the same medium shell octal socket was retained on the new tube so that no difficulty with socket clamps will be experienced.

A stronger tube mount was made possible by using a wafer stem construction rather than the old flat press stem construction. A comparison of these two types of stems is shown in Figure 1 of *The New Sylvania 6BQ6GTA Horizontal Output Tube*, elsewhere in this issue. The stem is the bottom of the glass tube envelope along with the leads that make internal connection to the tube mount. On a wafer stem, the leads are arranged in a circle so that there is

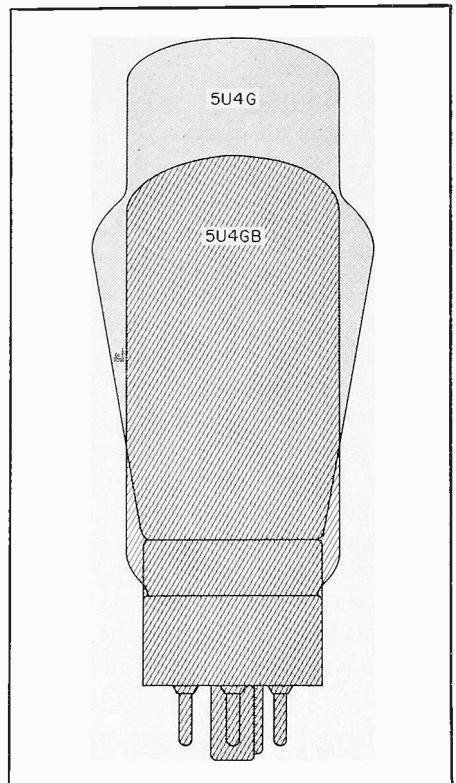


FIGURE 3

A Sylvania 5U4GB superimposed on the 5U4G. The 5U4GB utilizes the modern T-12 bulb ($1\frac{1}{8}$ " in diameter) which gives the greatest glass surface area in the smallest possible space for better cooling.

direct support of the mount by the tube's base.

TV Receiver Rectifier Operation

Inasmuch as the power supply is the keystone to set operation, the rectifier tube might be considered the most important tube in the set. Television receivers with picture tubes that are 17" or larger require high current from the low voltage rectifier which taxes the capabilities of any of the older full-wave rectifiers. As a result of this, the rectifier may burn out or merely lose emission capabilities which will result in reduced D C supply voltage.

The new Sylvania Improved Service 5U4GB has a current rating of 275 Ma at 450 Volts output to the capacitor input filter. This extra margin over the 225 Ma for the older prototype will relieve many of the problems now surrounding the Type 5U4G. It is a universal replacement tube which will also find use in high power amplifiers, radio transmitters and other equipment requiring a high current full-wave rectifier.

COMPARISON CHART OF THE 5U4GB TO THE 5U4G		
5U4G	Sylvania's 5U4GB	Resulting Improvement
Construction		
Flat Press Stem	Wafer Stem	Eliminates stem electrolysis and also provides stronger mount construction.
Regular Plate—ST16 Bulb No Bottom Mica	Redesigned Bottom Mica	Permits increased ratings. Improves filament alignment and reduces internal arcing.
Typical Operation		
R.M.S. Voltage Per Plate	450	450 Volts
Max. D C Output Current	225	275 Ma
Peak Plate Current Per Plate	675	1000 Ma



FIGURE 1

The new, Sylvania developed, 5U4GB will be shipped in the redesigned, distinctive yellow and black tube carton—the calling card for the high Quality Sylvania tube inside.

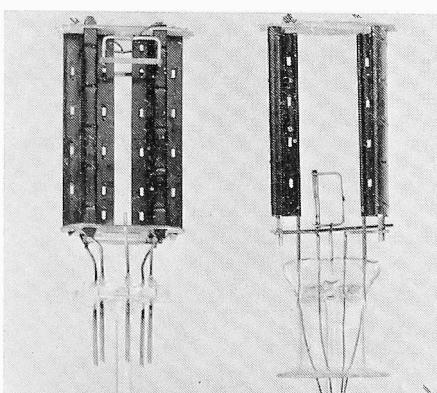


FIGURE 2

Tube mount and stems for the Sylvania Type 5U4G, on the left, and 5U4GB, on the right. Notice the two supporting (top and bottom) micas on the 5U4GB and more rugged overall appearance.

THE NEW SYLVANIA 6BQ6GTA

(Continued from page 6)

duced in the Sylvania Type 6BQ6GTA by a newly designed beam confining plate which acts as a shield to catch the electrons that may have strayed over or under the anode. This new plate is made in one piece with horizontal cross pieces that extend above and below the anode, up to the mica—it may be seen in Figure 2. The beam confining plate is a natural shield, because it is normally tied to the cathode. Also, the anode plate wings are folded to stop electron leakage.

The extremely high temperature developed in power tubes may cause loosening of the top-cap, if one is used, because the top-cap has little surface area for air cooling and the plate leads used are relatively light for good heat conduction. The Sylvania

Type 6BQ6GTA uses special high temperature melting point solder for the top-cap connection, to prevent this from occurring.

The high temperature at which the horizontal output tube operates may also induce grid emission. This problem is practically eliminated from the control grid in the new Type 6BQ6GTA by the large grid heat radiator that keeps the control grid cool—it is seen above the top mica. Also, grid No. 2 is made of specially coated wire which results in considerable improvement in regard to secondary emission.

These and other improvements included in the Sylvania Type 6BQ6GTA have proven to give superior horizontal output stage performance in the exhaustive tests given it in the Sylvania laboratories.

The New Sylvania 12AU7A

Here is important vacuum tube news. A duo-triode with military quality performance for commercial application is now available. The Type 12AU7A construction, up to now, has been used exclusively in military service because of its short, rugged and more expensive construction. Recognizing the need for such a tube in television receivers to achieve more stable performance, Sylvania is offering the 12AU7A for television use. This new tube may be seen in Figure 1 of *New Sylvania TV Tube Designs for '54*, the introductory article for this issue.

Combining the good features of the "old reliable" 12AU7 with new design features, the 12AU7A provides exceptional performance as either a horizontal or vertical oscillator, or as a vertical deflection amplifier. Also, it may be used for other applications for which the 12AU7 was formerly used, such as sync separator and sync oscillator.

The 12AU7A is especially recommended as a horizontal oscillator replacement for the 12AU7 in television receivers in which jitter and bounce occur from sound vibrations emanating from the loud speaker.

Low-microphonic level is an outstanding feature of the 12AU7A, along with greater stability and fewer heater-cathode failures. These features result from the shorter length and larger diameter construction which increases rigidity between parts and minimizes bowed cathode difficulties. It also surpasses 12AU7 performance in reduction of shorts and plate current cutoff problems.

Other construction features of the 12AU7A are: symmetrical plate construction with heat radiators on the shorter dimension resulting in better cooling; and longer leakage path between grid and plate reducing leakage to an infinitesimal value which is important in high pulse applications, such as for television horizontal oscillators.

THE 219/220 TUBE TESTER SHORTS TEST

By J. H. Mintzer

Supervisor, Factory Service

We offer the following explanation of the 219/220 shorts test operation, to help you to better understand its use and advantages over the old type neon lamp test.

The 219/220 tube testers utilize a continuous reading ohmmeter type test whose range extends from 0 to approximately 2 megohms. The center scale reading has been set at 250,000 ohms so that any tube with a leakage resistance less than that, would read in the lower or REPLACE section of the scale. Such a tube would be worthless in practically any application.

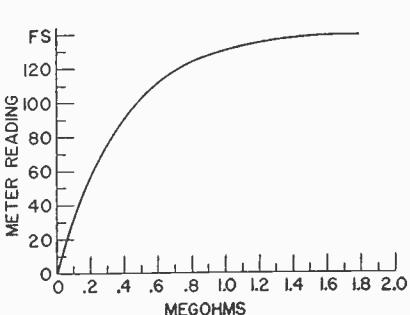
Some circuits will tolerate a considerable amount of tube leakage while others are much more critical. Therefore, a tube may fail in a critical circuit because of leakage, but when tested will read well up into the green or GOOD section of the scale. For example, a tube which failed in such a circuit may show a meter reading in the green scale of 100. By looking at the graph drawn right, it can be seen that the tube has a leakage resistance of approximately 500,000 ohms. Such a tube would probably operate normally in a less critical circuit.

It can be seen from this, that the 219/220 shorts test enables the user to select tubes for various circuits according to the amount of leakage that particular circuits will tolerate. This feature is not possible in the neon lamp type test, since it is a case of the lamp either lights or it doesn't. The point at which it lights will also vary with temperature, age or use.

When using the 219/220 shorts test, the serviceman should always bear in mind that he is reading an ohmmeter rather than a go or no-go indicator.

The graph drawn below will be of help in determining the approximate amount of leakage resistance from the meter reading.

Large, full page, graphs are available. Send your request to—J. H. Mintzer, Supervisor of Factory Service, Sylvania Electric Products Inc., 1221 West Third St., Williamsport, Pa.



QUARTER CENTURY MEMBER RECOMMENDS SYLVANIA TUBES

SYLVANIA NEWS

MERCHANDISING SECTION

OCTOBER 1954

Vol. 21, No. 8

Edgar K. James has a radio television service business in Chesham, New Hampshire. The business is young, still small, but beginning to grow.

James is a man in his sixties and was not always a radio television service dealer. Far from it! He is, however, one of the very few service dealers who can boast an intimate association with radio and other allied communications dating virtually from the conception of these symbols of Twentieth Century progress.

A member of the Quarter Century Wireless Association, Inc., and a member of the De Forest Pioneers, Inc., James became interested in radio in 1906. In 1907 he began working as a salesman for Manhattan Electrical Supply Co., one of the two American outlets (at that time) for radio hobbyist supplies. He was also in charge of developing new items to satisfy a small but insistent demand for communications material. James recalls that he made and sold many primitive condensers and coils, crystal detectors (silicon, galina, and carborundum).

A Real Radio Pioneer

In this business James met, worked with, and joined organizations made up of men who were to leave the deepest imprints on the science of Electronics. He was one of the original members of the Wireless Engineering Society which became the Institute of Radio Engineers in 1910. He was one of the first members of the Radio Club of America which began holding meetings in 1909.

James started his own electrical contracting business in 1911. He was therefore one of the first persons practicing electronics who was recognized by being registered under the first law (1912) licensing "electrical hobbyists."

During these early days James became acquainted with Doctor Lee De Forest, inventor of the vacuum tube. De Forest was experimenting with the vacuum tube at that time and James often accompanied him to his laboratory to help him work on various phases of the project. James recalls that De Forest broadcast an aria sung by Enrico Caruso from the Metropolitan Opera House on January 20, 1910. The quality of that broadcast, James remembers, was certainly the equal of the best sound one could obtain then from an acoustic recording of Caruso's voice played on an early gramaphone.

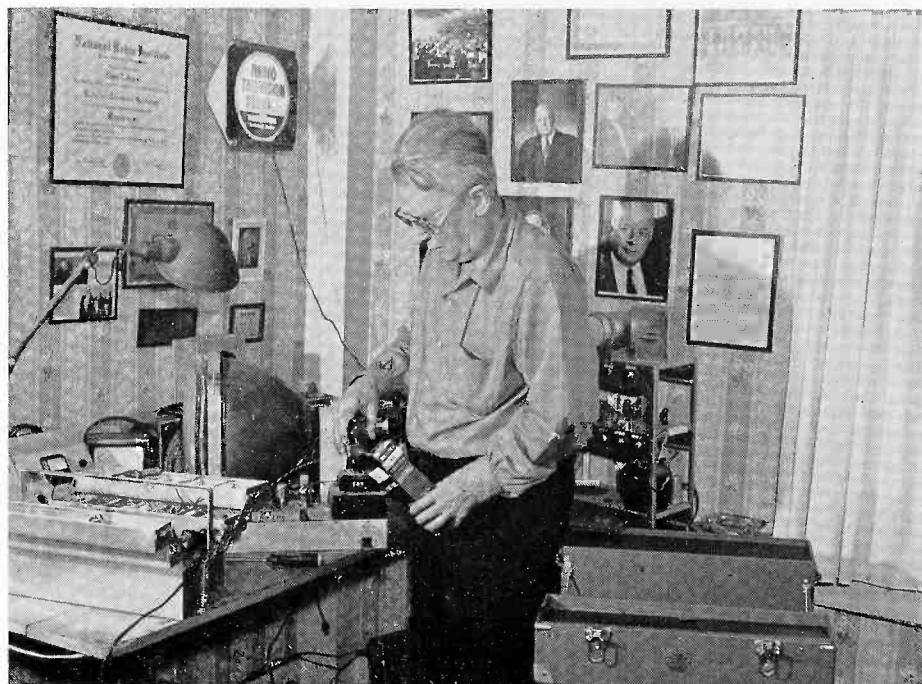
Another incident James recalls with pleasure was the musical program broadcast in 1913 via tuned sparks by Marconi from his yacht Electra as it lay in New York Harbor.

The first broadcasting station with any kind of permanent schedule was

established in 1919 when De Forest and other members of the pioneering radio tribe set one up in New York on The World Tower at 40th Street and Sixth Avenue. It is James' recollection that the antenna for the station was stretched from the Tower across the Sixth Avenue elevated platform to the old Beaux Arts building.

James' interest in radio was so intense that in 1920 he gave up his business and went to work for Stanley & Paterson, electrical and radio parts house, to design and manufacture headphones and loud speakers. This was the work James did by day. By night he was also busy. In his spare time he helped engineer the transmitter and build the speech amplifier for Radio Station WHN in New York. In 1921 he designed, built, and installed a 500 Watt transmitter for

(Continued to page 11)



E. K. James is shown replacing a tube in a television chassis. His bench is located in a room on the second floor of his home. On the walls may be seen many photographs and the documentation which pertains to James' early association in radio.

ORDER YOUR SYLVANIA DEALER OUTDOOR SIGN



DEALER IMPRINT

If you haven't, you are losing out on the best business builder you can buy.

Sylvania's big, new, brilliant outdoor dealer sign represents the best bargain of its type ever offered a service business. This "more for your money" sign is the only one that offers the service dealer so much space for his own name imprint, for the low cost of \$24.95.

More than 800 square inches of imprint space are available on this big 18 square feet of sign. You can't buy another sign to match this one for value.

The Sylvania outdoor sign tells your potential customer who you are and what you do. A big, full 40" x 42", it will draw customers to your store with its attractiveness and colorfulness.

Its five brilliant, high-gloss, baked-on Dulux enamel colors—red, green, yellow, black and white, will make it the brightest sign on your block. No one can miss identifying you as the top man for television service in your neighborhood.

And this sign is made to last. It resists moisture and rust. Made of 16-gauge steel, it is sure to bring you more business for years and years.

This sensational outdoor sign is available right now at your Sylvania distributor. The \$24.95 price includes your specified imprint. In addition, the sign comes with all the hanging hardware you need for quick, easy installation—brackets, side braces, screws, plugs, hanging instruction—everything you need to put it up.

To help you get the best out of your business, you must identify it. No other piece of store identification material has ever been offered the radio-television service dealer that gives him the effectiveness of the Sylvania outdoor sign for such a low price. Don't pass up this opportunity to attract new customers. See your Sylvania distributor today.

QUARTER CENTURY MEMBER RECOMMENDS SYLVANIA TUBES

(Continued from page 9)

the first San Antonio, Texas, radio station, WOAI. In the same year, for Hearst Publications, he designed and installed the first automatic transmission of teletype by air. The distance involved was from Columbus Circle in New York City to Tarrytown, N. Y.

During part of 1922 James had an experimental job with DeForest Radio in Jersey City, N. J., which involved working on the reflex circuit.

The Freed Eisman Company hired James in 1923 as its Sales Manager for their first radios. The first Freed Eisman radios were shipped less tubes. Shortly thereafter, however, James got together with Sylvania and made package shipments of Freed Eisman sets and Sylvania receiving tubes. James remembers the Sylvania

Receiving Tube Type 201-A fondly. "Sylvania always has made good tubes," he says.

Two other memorable events occurred during this same period. James had the honor of installing the first radio in the White House for President Calvin Coolidge.

For the 1923 Radio and Electrical Show at the Kingsbridge Armory, Bronx, N. Y., James made the amplifier, then supervised distribution of the events of the Show to all of the New York City stations. He was acting as Engineer of Radio Station WAHG the first time Al Smith spoke over the air and gave his famous pronunciation of the word "radio".

Recognizing his services in behalf of radio amateurs for almost twenty years, the Executive Radio Council in 1925 presented a loving cup to

James.

From 1926 to '28 James became a sales representative of various radio parts manufacturers. By '29 he was back in the electrical contracting business, where he remained except during the New York City World's Fair when he managed one of the largest electric exhibits, until the middle of World War II.

Poor health forced James to move to New Hampshire in 1944. Shortly thereafter he resumed his electrical contracting business and in 1950 installed the first complete fluorescent school in the State of New Hampshire (in the town of Surry) with Sylvania fixtures and tubes.

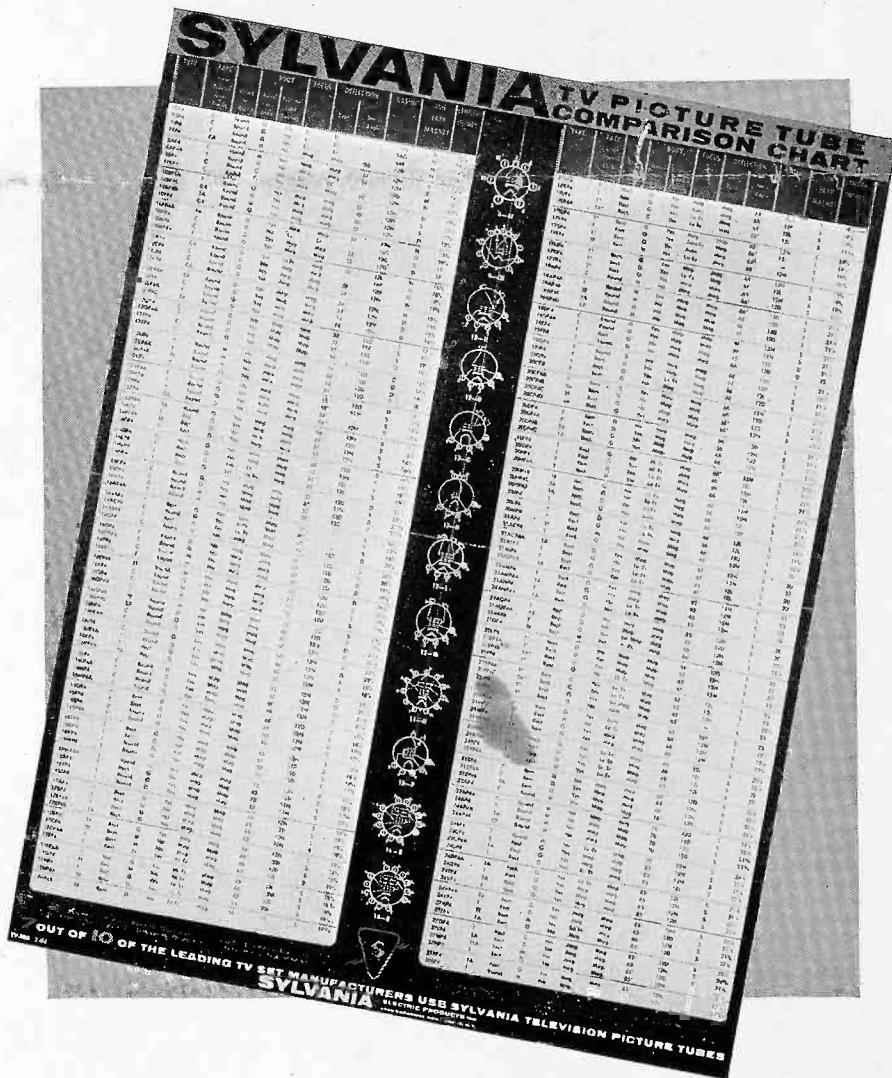
James' health grew worse, and in 1952 and '53 he was confined to the Pembroke Tuberculosis Sanatorium

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NEW TV TUBE COMPARISON CHART NOW AVAILABLE

The newly revised up-to-date Sylvania picture tube comparison chart is now available from your Sylvania distributor or by mail from Sylvania's Advertising Distribution, 1100 Main Street, Buffalo 9, N. Y.

This handy wall chart incorporates the latest information on Sylvania Picture Tubes, including new aluminized types, in easy-to-read form. You will find listed, in addition to all the latest aluminized types, current changes affecting overall length, shape, face plate coating, etc., on the standard types. This chart is designed to provide instant reference on all types of picture tubes.

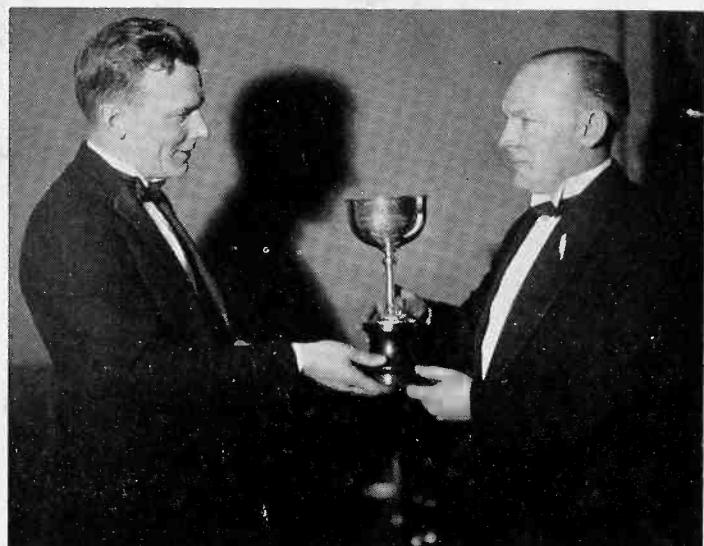


QUARTER CENTURY MEMBER RECOMMENDS SYLVANIA TUBES



The above (left) is an overall view of most of the displays at the 1923 radio and electrical show held in the Kingsbridge Armory.

The photograph (right) dates from 1925. In that year the Executive Radio



Council presented a loving cup to James (shown at right) recognizing his services in behalf of radio amateurs for 20 years. George Drosti, now Vice President of the Quarter Century Wireless Association, Inc. is shown presenting the cup to James.

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at which time he renewed his interest in the radio and TV business. While in the Sanatorium he took a radio-television service course sponsored by the National Radio Institute. He completed the final portion of the course concerning television service shortly after leaving the hospital.

Today James has a small but burgeoning business that draws customers from Chesham, Harrisville, Dublin, Nelson and Marlboro, N. H. In this territory TV receivers pick up two Boston stations and the station in Manchester, New Hampshire.

An old-time advocate of Sylvania tubes James finds them as ever reliable, and now since he is a Service dealer, money-saving as to callbacks. James enjoys the service business and feels that this is simply another interesting phase of an already fascinating life crowded with memorable events.

SYLVANIA NEWS

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OCTOBER, 1954

PUBLISHED BY

SYLVANIA ELECTRIC PRODUCTS INC.

MANUFACTURERS OF SYLVANIA RADIO TUBES, CATHODE RAY TUBES, ELECTRONIC DEVICES, FLUORESCENT LAMPS, FIXTURES, WIRING DEVICES, ELECTRIC LIGHT BULBS, PHOTOLAMPS, RADIO AND TELEVISION RECEIVERS.

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