# SYLVANIA NEWS

## TECHNICAL SECTION



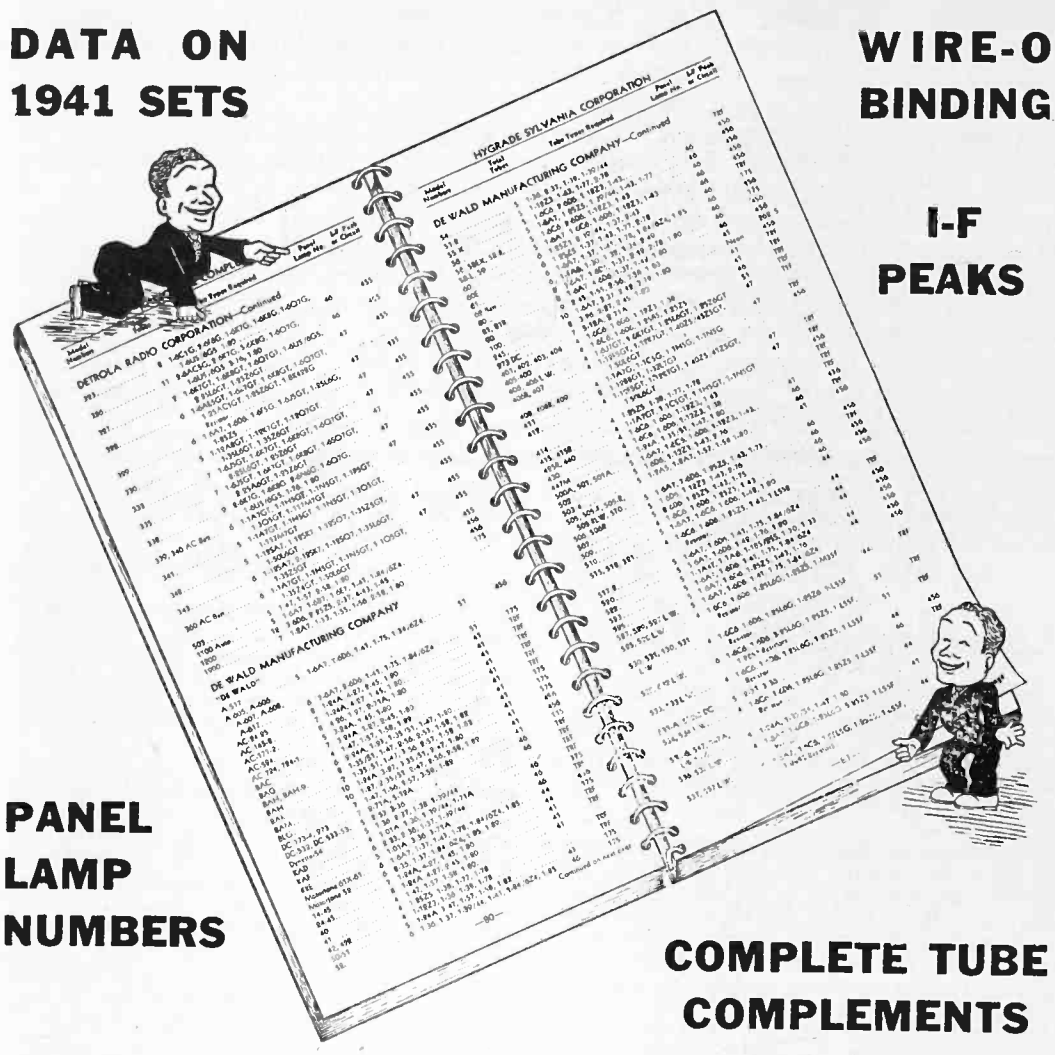

JANUARY-FEBRUARY, 1941 EMPORIUM, PENNA. Vol. 9, No. 1

# NEW TUBE COMPLEMENT BOOK

**DATA ON 1941 SETS**

**WIRE-O BINDING**

**I-F PEAKS**




**PANEL LAMP NUMBERS**

**COMPLETE TUBE COMPLEMENTS**

No ballyhoo is necessary to announce a new edition of the Sylvania Tube Complement Book. The first edition, published in August 1937, has become one of the most valuable possessions of thousands of servicemen.

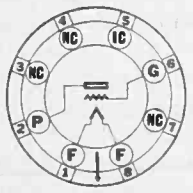
Edition 2, like its predecessor, contains much information not available in handy form in any other publication. In its 272 pages will be found data on 16,730 radio models, under 586 trade names, made by 190 radio receiver manufacturers. Tube replacement information is given for 100,380 sockets. This compares with 168 pages, 10,386 models, 560 trade names, 560 manufacturers, and 75,000 sockets in the first edition.

The outstanding new feature is the addition of Panel Lamp Numbers for many models. While this is not 100% complete, due to difficulty in getting data on older receivers, it is the first time that this information has ever been compiled for servicemen. I-F Peak information has been increased, and is as nearly complete as our own research and the cooperation of set manufacturers can make it.

The price—35c per copy. Order from your Sylvania jobber or use the coupon on page 3 of the Main Section.

# NEW TUBES

## Sylvania Type 1LE3 General Purpose Triode




4-AA

Sylvania Type 1LE3 is a general purpose triode of "Lock-In" construction, designed especially for use in low drain battery operated receivers. The electrical characteristics make it especially desirable for use as an oscillator. When the tube is used without a C battery, the grid return should be made through a 1 megohm resistor to the negative filament.

The circuit applications are the same as those for Type 1E4G.

### CHARACTERISTICS

| | |
|---|---|
| **Filament Voltage DC** | **1.4 Volts** |
| **Filament Current** | **0.050 Ampere** |
| **Bulb** | **T9-G** |
| **Base—"Lock-In" 8-Pin** | **4-AA** |
| **Mounting Position** | **Any** |

**Direct Interelectrode Capacitances:***

| | |
|---|---|
| **Grid to Plate** | **1.7 μμf** |
| **Input (Grid to Fil.)** | **1.7 μμf** |
| **Output (Plate to Fil.)** | **3.0 μμf** |

*With standard RMA tube shield connected to negative filament.

### Ratings:

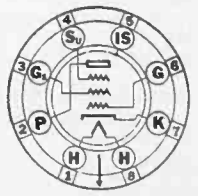
| | |
|---|---|
| **Maximum Filament Voltage:** | |
| **Battery Operation—Voltage must never exceed** | **16. Volts Max.** |
| **AC/DC Power Line Operation—Design Center** | **1.3 Volts Max.** |
| **Plate Voltage** | **110 Volts Max.** |

### Operating Conditions and Characteristics:

| | | |
|---|---|---|
| **Filament Voltage** | **1.4** | **1.4 Volts** |
| **Filament Current** | **0.050** | **0.050 Ampere** |
| **Plate Voltage** | **90** | **90 Volts** |
| **Grid Voltage**** | **0.0** | **−3 Volts** |
| **Plate Current** | **4.5** | **1.4 Ma.** |
| **Plate Resistance** | **11,200** | **19,000 Ohms** |
| **Mutual Conductance** | **1,300** | **760 μmhos** |
| **Amplification Factor** | **14.5** | **14.5** |

**Negative filament return, Pin No. 8.

## Sylvania Type 7H7 Triple Grid Amplifier




8-V

Sylvania Type 7H7 is a "Lock-In" triple grid semi-remote cut-off amplifier somewhat similar to Type 6AB7/1853, except that the mutual conductance and heater current are slightly lower.

Type 7H7 is particularly adapted for r-f and i-f stages in television and frequency modulation receivers where, due to the low impedance of the circuits and inherent low gain, the use of a tube of this type is highly advantageous.

*(Continued on page 4)*

## FREQUENCY SHIFTS

Starting March 29, ninety per cent of the radio stations in the U. S. A. (between 730 Kc and 1600 Kc) will shift frequencies under the North American Regional Broadcasting Agreement. To the set owners, this means a re-setting of push-buttons for their favorite stations, or re-locating those stations on their dials if they have no push-buttons.

To the servicemen it means one of the biggest opportunities for new business that has ever been presented. It is estimated that there are over ten million push-button receivers in use, and everyone of these is a potential service job. Of the millions of non-push-button owners, there will be a large number who will want information on the frequency changes, and help in establishing their favorite stations on their dials. This opportunity for the wide-awake servicemen to contact radio owners does not stop at re-setting the receivers for new frequencies; it paves the way for service work on many receivers that are not in good operating condition. The possibility of sales for tubes, parts, etc., should inspire all servicemen to plan an aggressive program to get in on this business.

Sylvania's part in this program is to supply sales and advertising helps which servicemen will need. All of these helps are illustrated and explained on page 3, in the main section of the News. Refer to them right now and order your material before it is too late. Remember the date—March 29.

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## TESTING TYPES 117Z6G and 117Z7GT

Types 117Z6G and 117Z6GT with the heater tap eliminated, were explained in Technical Section Volume 8, Number 11, along with new tube tester settings. As outlined in that information, the newer tube with the heater tap eliminated cannot be tested in many testers without making changes in the control settings. Given below are additional data supplied by three tube tester manufacturers:

### Supreme Instrument Corp.

Each plate tests separately on all Supreme models below:

**Models 385, 89 Series**

| | | |
|---|---|---|
| Fil. Volts (Hi) | 30 | 30 |
| Fil. Return | 7 | 7 |
| But'n Down | 8 | 4 |
| Qual. Sel. (R) | 43 | 43 |
| Qual. Sel. (S) | 32 | 32 |

**Model 594**

| | | |
|---|---|---|
| Fil. Volts (Hi) | 30 | 30 |
| Fil. Term. | E | E |
| Meter Ckt. | A | A |
| But'n Down | 4 | 7 |
| Qual. Sel. | 52 | 52 |

Remarks: 12A5/12Z5 Switch Up

| | Model 400 | | Models 501, 502 | |
|---|---|---|---|---|
| Fil. Volts (Hi) | 30 | 30 | 30 | 30 |
| Fil. Return | 2 | 2 | 2 | 2 |
| Switches Up | 47 | 78 | 3 | 5 |
| Met. Ckt. | A | A | A | A |
| Qual. Sel. | 15 | 15 | 52 | 52 |

**Models 500, 505, 585**

| | | |
|---|---|---|
| Fil. Volts (Hi) | 30 | 30 |
| Fil. Return | 2 | 2 |
| Switches Up | 47 | 78 |
| Met. Ckt. | C | C |
| Load Sel. | 90 | 90 |
| Shunt Sel. | 3 | 3 |
| Qual. Sel. | 60 | 60 |

### Weston Electrical Instrument Corp.

**Models 773, 774, 775, 777 and 778**

| Fil. Sel. | Tube Sel. | "In" Pos. |
|---|---|---|
| 14 | 45 | B & D |

### Earl Webber Company

**All testers manufactured by this company during 1940, as well as modernized testers, made tests on the 117Z6 with voltage applied across the complete heater and did not use the heater tap. Therefore, there are no changes for the testing of the new tube without the heater tap.**

## A CHAT WITH ROGER WISE

Chief Tube Engineer
Hygrade Sylvania Corporation

When development work was started on what is now the "Lock-In" tube, the field of greatest importance was, of course, that of the broadcast receiver applications. At that time, while the higher frequency field was not of great commercial importance, there were indications that interest in that field might grow rapidly in the future, and, as a result, the requirements of high frequency service were kept in mind in working out the final design.

It is gratifying to note that the useful frequency range of standard "Lock-In" tubes is so wide. As an example the standard triode type 7A4 will oscillate as high as 300 megacycles as a result of its short leads and low lead-in wire capacitances. The exact upper frequency limit is, of course, determined by circuit considerations. For a given type of circuit it is convenient to assume that the upper frequency limit of usefulness of the tube is determined by the highest frequency at which the tube can be made to oscillate.

In the battery group, type 1LE3 has recently been standardized, which is also an unusually good oscillator at high frequencies. Various special tubes having smaller electrode spacings and small elements have been made up to extend the range of operation of "Lock-In" tubes in the high frequency spectrum. With some of these types the upper limit has been extended above 500 megacycles, and over most of the range considerable power output is obtainable. Some of these special types are being supplied for industrial applications, and information is available on request to those who are in a position to use such tubes in quantities.

Recent articles in amateur publications such as "QST" have shown interesting applications of "Lock-In" types in high frequency circuits, and readers who have not reviewed such articles are referred to them for interesting data.

## TESTING TYPES 30, 1H4G and 2A3

### Correction for Your Tester

Reports have recently been received that Sylvania type 30 tubes do not test high enough on tester readings, but are satisfactory in receiver operation. Upon investigating the reports it was found that the condition existed when testing with a Precision Series 910, –12, –14, –15, –20, –22 or –45.

The settings specified for these instruments do not allow the correct filament voltage to be applied to the tube, being in the neighborhood of 1.75 volts. Because Sylvania type 30 tubes are constructed with insulator hooks on the filament to insure a more non-microphonic tube, the test readings are not as high as type 30 tubes without the hooks.

This problem has been worked out with Precision Instrument Company and new settings have been established for all 910, –12, –14, –15, –20, –22 and 45 Series.

The new settings are given below for type 30, the "G" equivalent type 1H4G, as well as a correction for testing type 2A3.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Type 30 | 3 | 3 | 17 | 23 | 1 | 1 | B |
| Type 1H4G | 4 | 3 | 17 | 23 | 1 | 1 | B |
| Type 2A3 | 3 | 4 | 40 | 4 | 1 | 1 | B |

The index charts for all of the above instrument numbers should be changed to conform to the new settings so that future tests will be in line.

• • •

## COMBINED TYPES

There has recently been a change in two Sylvania type numbers which simplifies the problems involved in the multiplicity of types. The new type numbers are 6AB5/6N5 and 14A7/12B7. Type 6AB5/6N5 may be used as a direct replacement for either type 6AB5 or 6N5. Likewise, 14A7/12B7 may be used as a replacement tube for either 12B7 or 14A7.

## NEW INVENTIONS AND SYLVANIA

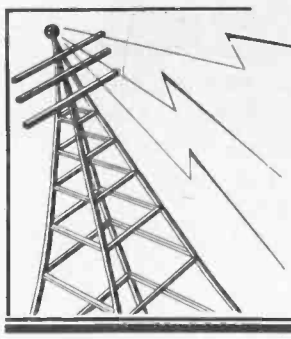
The foundation of new inventions and their aggressive marketing is the kind of "new Economy" which has been fostered by America since the days of the thirteen colonies and the continuation of this aggressive mechanical and business ingenuity can with reasonable certainty solve our problems.

Typical of this spirit of improvement for tomorrow are the achievements of Hygrade Sylvania. In the radio and lighting Industries Hygrade Sylvania has invented, sponsored and promoted new designs and new developments during the past decade in these broad fields which have widened markets for radio and for new types of lighting, in the face of what have often seemed to be saturated markets.

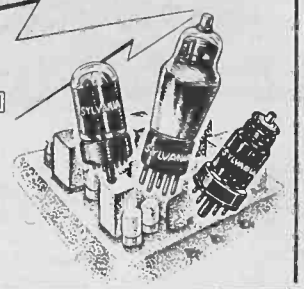
In the radio tube field Hygrade Sylvania has discovered and promoted new radio tube developments which have not only expanded the radio set market, but also have improved tonal reproduction and made set circuits more efficient and compact, such as the 6.3 volt tube for auto radios and the 1.4 volt low drain battery tubes for portable radios.

The 6.3 volt tube prepared the way for the rapid expansion of the auto radio market and also made it possible to introduce AC-DC sets, which now account for more than 20,000,000 of the total home radios in use. The 1.4 volt low drain battery tube made the sale of portable radios last year one of the most spectacular and sudden successes ever experienced in the radio market. The number of portables in use shot upward from 200,000 on January 1st, 1939 to over 900,000 on January 1st, 1940.

In the field of lighting the lamp division has pioneered and developed the new Flourescent light. This new lighting utilizes an entirely different scientific principle compared with incandescent lighting. Its minimum glare, or reduction of dark shadows to almost no shadows, makes it ideal for factories and offices because it is easy on the eyes. This new lighting market, which is opening up rapidly in the home lighting field, as well as the industrial field, is expanding the activities of builders, electric contractors and a number of associated enterprises.



# The SERVICE EXCHANGE



THE information presented in the Sylvania Service Exchange is contributed by service men as the result of practical experience. It is very carefully considered before being accepted, and we believe it to be correct and authentic. However, we assume no responsibility with respect to results. Each hint accepted entitles the writer to his choice of one Sylvania receiving tube. Please indicate preference when submitting hints. Don't send routine or generally known information. Please specify tube choice.

**Lafayette Model C-38.** This receiver was brought to me during one of the recent high humidity periods, with a very annoying audio hum. I happened to move the resistor that connects from the volume control 175,000 ohm tap to the tone control. (This is R12 on the Lafayette C-38 diagram). When moved, the hum decreased very noticeably. I found that the trouble was caused by a faulty piece of insulation over the lead from this resistor to tone control. The lead is placed so close to the chassis that the insulation breaks down causing the hum when a damp condition exists. The remedy is to move the lead away from the chassis until the hum disappears. A new piece of insulation will also do the trick.—Frank R. Nutter, Milton, N. H.

* * *

**Mica Replacement.** It is supposed that shorted trimmers on these so called "Push Buttons" have become a service item that we all have encountered and have had to put the set away until a piece of mica was available or a new assembly was secured. Recently, I had a set given me to get going as fast as possible, while the customer waited. As usual, mica supply gone, exact replacement was impossible. While hunting for a substitute, the roll of Cellulose Tape came into view, ½ inch in width, perfect insulation qualities and practically made to order. The old mica was adhered to the tape and replaced. Inquiry recently disclosed that the station was still in tune and had plenty of pep.

As most of us carry this transparent tape for one reason or another, I suggest that this tape be tried the next time that a mica shorts through and a new piece is not available. It really works. The additional thickness of the dielectric is automatically compensated for when the set is re-aligned.—Chas. W. Hackenyos, Philadelphia, Penna.

* * *

**Nash Model T7, T8.** These sets often develop a hum which indicates a defective filter block. However, before quoting a filter job, carefully test the 0.1 mfd. bypass midpoint between the two type 41 tube grid resistors. If this condenser is open the set will hum like a defective filter. The condenser is located under the filter terminal board over the 41 tube socket and is easily replaced.—John F. Larkin, Boscobel, Wisconsin.

* * *

**Noisy Plate Coils.** To find noisy plate coils quickly, jump a 10 M ohm resistor from plate to ground. The noise will increase 50% if the coil is defective.—Gregg Dodson, Tampa, Florida.

* * *

**Philco Models Pt-2, Pt-6, Pt-25, Pt-26.** If these and other Philco AC-DC sets have a loud persistent hum only when the set is turned to a signal, this is generally caused by a leaky filament resistor. This is a candohm unit which will have a high resistance to the chassis when both ends are unsoldered. This defect results in a-c being fed into the return of the a-v-c circuit.—Kenneth C. Jewell, Mt. Vernon, Ohio.

* * *

**Philco Models Th4, Pt26.** High and low volume which is not from faulty filter condensers is often from the a-v-c lead (blue) and bypass condenser being connected to the socket lug of the 35Z3 tube. The trouble is caused by high resistance leakage between socket lugs. The a-v-c lead and condenser are connected to an unused lug of the 35Z3 socket, adjacent to the high voltage connection of the tube.—Harold Freed, Irvington, N. J.

* * *

**Philco Models 608P, 610P.** These phone combinations and all beam of light jobs may have a hum, sounding like an open grid circuit, when the radio band switch is set to "Phono." This is magnetic pick-up of the flux field of the power transformer. To check remove the black shielded lead from the coupling transformer to the set. The noise should stop. Insert this lead again and remove the brown lead from the pick-up to the coupling transformer. The noise should continue. To remedy, remove the coupling transformer from the top of the cabinet and mount on the left hand side of the cabinet about 8 inches from the top. This will cause all the hum to disappear.—Kenneth C. Jewell, Mt. Vernon, Ohio.

* * *

**RCA Model R32.** Duplicate replacement of original volume control in these sets often becomes noisy. An effective method of eliminating this trouble may be employed by using 1 100,000 ohm volume control with a few circuit changes as follows:

1. Tie together two black wires on back of original volume control. Cut off yellow wire.
2. Cut off both yellow wires on front of control, (next to end of shaft).
3. Disconnect two white wires from phono. switch.
4. Disconnect white wire from first audio transformer and connect to grid of first audio 26 tube. Connect other end of same wire to center top of 100,000 ohm volume control.
5. Ground right hand side of control, looking from front of control.
6. Cut off other white wire which was disconnected from phono. switch.—Paul K. Brady, Suffolk, Va.

* * *

**RCA Model 46X1.** This is a 1941 model and is in a plastic cabinet, the tubes used are one 12SA7, one 35Z5, one 12SK7, one 50L6 and one ballast tube M86892-9. When this set is very noisy, there will likely be found an intermittent open condenser in the loop aerial circuit. This is an 0.01 mfd. condenser found on the back rear panel. It is located close to the 50L6GT tube and no doubt the heat from this tube is the cause of the trouble. This defect has shown up in different sets and in replacing the condenser they come back to the shop with the same trouble. Now when I replace the condenser I move it over to a cooler location. This corrects the trouble.—Wm. Lofstrom, Valdosta, Ga.

* * *

**RCA Model RAE59.** For intermittent reception try a new 0.1 mfd. condenser in the a-v-c circuit control grid return. The original condenser which is usually in a leaky condition is in the condenser block located in the power amplifier and is identified by its blue and black leads. When replacing, remove only the blue lead as the black is common to several other condensers.—Robert Ellias, Jacksonville, Fla.

* * *

**Speaker Shims.** Good speaker shims can be made from different size picture films. Each size film has a different thickness which makes it ideal for centering speaker cones. I cut the films in strips and have them handy when working on speakers.—Harold Wurm, Appleton, Wis.

* * *

**Spiegel Portable with Short Wave Band.** This straight battery portable may come to you with no operation on the broadcast band, but with the short wave band OK. Don't take it out of the cabinet, just remove the mounting screw from the bottom immediately under the dial-drive knob, and it will start playing. The screw goes too far into the case and evidently shorts out a portion of the oscillator coil. This condition can be detected by whistling it on an oscillator. It will pick up a weak signal at about 13 megacycles, when the dial is set at 1300 Kc. J. Darr, Mena, Ark.

**Stewart-Warner Models 5R4, 5R5, 5R6, 5R7.** In those locations where extreme sensitivity is necessary in a radio set, the 5R wood cabinet models (5R4, 5R5, 5R6 and 5R7) can be stepped up by the introduction of a slight amount of regeneration. This change can easily be made as follows:

Disconnect the .05 Mfd. condenser #23 from the suppressor grid terminal of the 12SK7 socket. In the Underwriters approved sets (Model 03-5R, etc.) connect it instead to the B minus terminal of the volume control. This is the terminal nearest the 12SQ7 socket, and is clearly indicated in the tube socket voltage layout of the service manual. In non-approved models (07-5R, etc.) connect condenser #23 to ground.

After the condenser change has been made, re-align the receiver. It is especially important to re-adjust trimmer #9, the broadcast oscillator padder, exactly as explained in the service manual. When aligning, keep the chassis away from the loop or oscillation may occur.

This change cannot be made on any of the plastic cabinet 5R sets (5R1 and 5R3). The plastic cabinet sets of this series will oscillate if they are stepped up beyond the present limit of sensitivity by this means.—STEWART WARNER SERVICE DEPARTMENT.

* * *

**Stromberg-Carlson Models 520PS, PN and PG.** In accordance with requests to eliminate some of the reproduction of high frequencies internally, and thus eliminate the necessity for using the tone control to minimize surface noise in the reproduction of phonograph records, a capacitor has been added to the circuit of all 520PS, PN and PG models manufactured after November 12, 1940.

This is a 75 mmf. capacitor (P-29359) located across the R6, 1.5 megohm resistor (from Terminal No. 3 of the 6V6 output socket to the single point terminal block located on the mounting support bracket of the variable capacitor). If the customer desires greater fidelity of reproduction of phonograph records this capacitor should be removed.—Stromberg Carlson Service Dept.

* * *

**W. E. Model 91A Amplifier.** If motorboating is encountered in this W. E. centralized school sound system, always check the output tubes for matched plate current. The plate current should balance within 10 or 15 mills. Save the low tubes for some future date to aid in matching a set that will not motorboat.—Calvin E. Mervine, Pottsville, Penna.

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**Zenith Model 4K310.** When this receiver is dead, disconnect the diode of type 1H5G and check for leakage from tube prong to ground. If leakage exists, a new tube socket should be installed.—Robert Ellias, Jacksonville, Fla.

## AFTER MARCH 29th

The change in Radio Station frequencies will mean added income for the wide-awake serviceman in:

**Re-Setting Push-Buttons**
**Replacing Old Tubes**
**Replacing Panel Lamps**
**Selling New Parts**
**Overhauling Receivers**
**Selling Attachments**

Use the Sylvania Helps outlined on Page 3 of the Main Section to cash-in on this business.

# INTERPRETATION OF RECEIVING TUBE RATINGS

A new standard for interpretation of radio tube ratings has been made by the RMA recently. The previous standard was shown in the Sylvania Technical Manual. A complete understanding of the ratings should be of help to everyone interested in radio tubes. The new standard is given below and supersedes that shown on page 12 of the last Technical Manual.

### 1. Cathode.

The heater or filament voltage is given as a normal value unless otherwise stated. This means that transformers or resistances in the heater or filament circuit should be designed to operate the heater or filament at rated value for full-load operating conditions under average supply-voltage conditions. A reasonable amount of leeway is incorporated in the cathode design so that moderate fluctuations of heater or filament voltage downward will not cause marked falling off in response; also, moderate voltage fluctuations upward will not reduce the life of the cathode to an unsatisfactory degree.

#### A. 1.4 Volt Battery Tube Types.

The filament power supply may be obtained from dry-cell batteries, from storage batteries, or from a power line. With dry-cell battery supply, the filament may be connected either directly across a battery rated at a terminal potential of 1.5 volts, or in series with the filaments of similar tubes across a power supply consisting of dry cells in series. In either case, the voltage across each 1.4 volt section of filament should not exceed 1.6 volts. With power line or storage battery supply, the filament may be operated in series with the filaments of similar tubes. For such operation, design adjustments should be made so that, with tubes of rated characteristics, operating with all electrode voltages applied and on a normal line voltage of 117 volts or on a normal storage-battery voltage of 2.0 volts per cell (without a charger) or 2.2 volts per cell (with a charger), the voltage drop across each 1.4 volt section of filament will be maintained within a range of 1.25 to 1.4 volts with a nominal center of 1.3 volts. In order to meet the recommended conditions for operating filaments in series from dry-battery, storage-battery, or power-line sources it may be necessary to use shunting resistors across the individual 1.4 volt sections of filament.

#### B. 2.0 Volt Battery Tube Types.

The 2.0 volt line of tubes is designed to be operated with 2.0 volts across the filament. In all cases the operating voltage range should be maintained within the limits of 1.8 volts to 2.2 volts.

### 2. Positive Potential Electrodes.

The power sources for the operation of radio equipment are subject to variations in their terminal potential. Consequently, the maximum ratings shown on the RMA Vacuum Tube Data Sheets have been established for certain Design Center Voltages which experience has shown to be representative. The Design Center Voltages to be used for the various power supplied together with other rating considerations are as given below:

#### A. AC or DC Power Line Service in U.S.A.

The Design Center Voltage for this type of power supply is 117 volts. The maximum ratings of plate voltages, screen supply voltages, dissipations, and rectifier output currents are design maximums and should not be exceeded in equipment operated at a line voltage of 117 volts.

#### B. Storage Battery Service.

When storage battery equipment is operated without a charger, it should be designed so that the published RMA maximum values of plate voltages, screen supply voltages, dissipations and rectifier output currents are never exceeded for a terminal potential at the battery source of 2.0 volts per cell. When storage battery equipment is operated with a charger, it should be designed so that 90% of the same RMA values are never exceeded for a terminal potential at the battery source of 2.2 volts.

#### C. "B" Battery Service.

The design center voltage for "B" batteries is the normal voltage ratings of the battery blocks, such as, 45 volts, 90 volts, etc. Equipment should be designed so that under no condition of battery voltage will the plate voltages, the screen supply voltages, or dissipations ever exceed the recommended respective maximum values shown in the data for each tube type by more than 10%.

#### D. Other Considerations.

**a. Class $A_1$ Amplifiers.**

The maximum plate dissipation occurs at the "Zero-Signal" condition. The maximum screen dissipation usually occurs at the condition where the peak-input signal voltage is equal to the bias-voltage.

**b. Class B. Amplifiers.**

The maximum plate dissipation theoretically occurs at approximately 63% of the "Maximum-Signal" condition, but practically may occur at any signal voltage value.

**c. Converters.**

The maximum plate dissipation occurs at the "Zero-Signal" condition and the frequency at which the oscillator developed-bias is a minimum. The screen dissipation for any reasonable variation in signal voltage must never exceed the rated value by more than 10%.

**d. Screen Ratings.**

When the screen voltage is supplied through a series voltage-dropping resistor, the maximum screen voltage rating may be exceeded, provided the maximum screen dissipation rating is not exceeded at any signal condition, and the maximum screen voltage rating is not exceeded at the maximum-signal condition. Provided these conditions are fulfilled, the screen supply voltage may be as high as, but not above, the maximum plate voltage rating.

### 3. Typical Operation.

For many receiving tubes, the data shows typical operating conditions in particular services. These typical operating values are given to show concisely some guiding information for the use of each type. They are not to be considered as ratings, because the tube can be used under any suitable conditions within its rating limitations.

# NEW TUBES

*(Continued from page 1)*

## TYPE 7H7—*Continued*

### CHARACTERISTICS

| | |
|---|---|
| Heater Voltage (Nominal) AC or DC | 7.0 Volts |
| Heater Current (Nominal) | 0.32 Ampere |
| Bulb | T9-G |
| Base—"Lock-In" 8-Pin | 8-V |
| Mounting Position | Any |
| **Direct Interelectrode Capacitances:*** | |
| Grid to Plate | 0.007 μμf Max. |
| Input (G to all other electrodes except P) | 8.0 μμf |
| Output (P to all other electrodes except G) | 7.0 μμf |

*With standard RMA Tube Shield connected to cathode.

### Ratings:

| | |
|---|---|
| Heater Voltage (Nominal) AC or DC | 7.0 Volts |
| Heater Current (Nominal) | 0.32 Ampere |
| Plate Voltage | 250 Volts Max. |
| Screen Voltage | 150 Volts Max. |
| Plate Dissipation | 2.5 Watts Max. |
| Screen Dissipation | 0.5 Watt Max. |
| External Grid Bias Voltage | 0 Volt Min. |

### Operating Conditions and Characteristics:

Class $A_1$ Amplifier

| | | | |
|---|---|---|---|
| Heater Voltage | 6.3 | 6.3 | Volts |
| Heater Current | 0.3 | 0.3 | Ampere |
| Plate Voltage | 100 | 250 | Volts |
| Screen Voltage | 100 | 150 | Volts |
| Grid Voltage | −1 | −2.5 | Volts |
| Suppressor | 0 | 0 | Volt |
| Plate Current | 8.2 | 9.5 | Ma. |
| Screen Current | 3.3 | 3.5 | Ma. |
| Plate Resistance | 0.25 | 0.8 | Megohm |
| Mutual Conductance | 3800 | 3800 | μmhos |
| Grid Voltage for Mutual Conductance of 40 μmhos (Approx.) | −12 | −19 | Volts |

## SYLVANIA TYPE 6U6GT

### Beam Power Amplifier

Sylvania Type 6U6GT is a power amplifier tube similar in characteristics to Type 6Y6G. It has lower heater current drain making it desirable where heater current must be maintained at a minimum. The circuit applications are the same as for other well known beam power tubes such as types 6V6G and 6Y6G.

### CHARACTERISTICS

| | |
|---|---|
| Heater Voltage | 6.3 Volts |
| Heater Current | 0.75 Ampere |
| Bulb | T9-D1 |
| Base—Intermediate Octal 7-Pin | 7-AC |
| Mounting Position | Any |

### Operating Conditions and Characteristics:

| | | | |
|---|---|---|---|
| Heater Voltage | 6.3 | 6.3 | 6.3 Volts |
| Plate Voltage | 110 | 135 | 200 Volts |
| Screen Voltage | 110 | 135 | 135 Volts |
| Grid Voltage | −10.5 | −13.5 | −14 Volts |
| Plate Current (Zero Signal) | 44 | 55 | 55 Ma. |
| Plate Current (Max. Signal) | 47 | 60 | 62 Ma. |
| Screen Current (Zero Signal) | 4 | 5 | 3 Ma. |
| Screen Current (Max. Signal) | 11 | 15 | 13 Ma. |
| Plate Resistance (Approx.) | 10,000 | 10,000 | 20,000 Ohms |
| Mutual Conductance | 5,600 | 6,200 | 6,200 μmhos |
| Load Resistance | 2,000 | 2,000 | 3,000 Ohms |
| Power Output | 2.0 | 3.3 | 5.5 Watts |
| Total Harmonic Distortion | 10 | 10 | 10 Per Cent |

### Base Pin Connections (Botton View)

| | |
|---|---|
| 1. No Connection | 5. Grid |
| 2. Heater | 6. No Pin |
| 3. Plate | 7. Heater |
| 4. Screen | 8. Cathode |

## HOW TO RE-SET PUSH BUTTONS

**A very complete article on the procedure to follow in re-setting the six basic types of push-button systems appears in the February 1941, issue of Radio Today, pages 40 and 41. We suggest that servicemen study this article carefully well in advance of March 29th, when the big rush will begin with the change of station frequencies.**

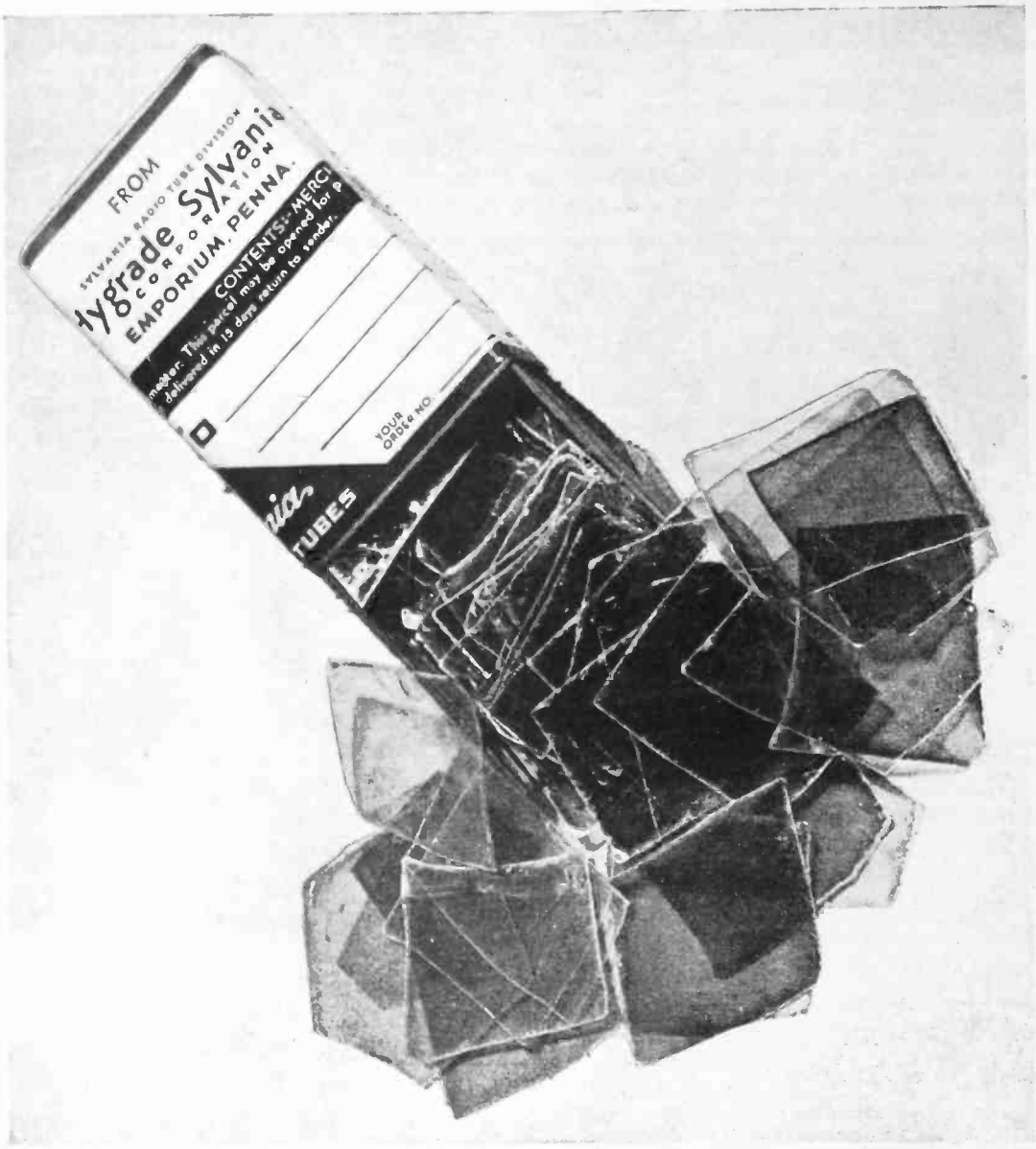
# SYLVANIA NEWS

## TECHNICAL SECTION




MARCH-APRIL, 1941 EMPORIUM, PENNA. Vol. 9, No. 2

# A MICA KIT FOR SERVICEMEN




**How often have you wished for a piece of mica to replace those shorted padders and trimmers? War conditions have already made mica hard to get and very expensive. With our usual policy of looking out for the needs of servicemen, Sylvania comes to their aid with a convenient Mica Kit containing a long-time supply. The pieces are of irregular shape and size, under 5/1000 of an inch thick, and can easily be cut to the desired shape. It is the finest quality obtainable with low dielectric loss—exactly the same as is used in Sylvania tubes. Too light weight makes it unsuitable for the quality standards of Sylvania tubes, and not of a type important in defense work, servicemen will find it just right for their needs.**

**The price—no fooling—10 cents a Kit to cover handling and mailing. To order, use the coupon on page 3 of the Main Section. Order one for shop use and one for your Service Kit.**

# MORE SERVICE JOBS

## Three Types of Adjustment Brought About by Reallocation

The shift of radio station frequencies on March 29th is completed for the radio stations, but for the servicemen there is still plenty of work to be done. There are probably many radio receivers on which the push-buttons have not been reset, and there are many other service jobs created by the station change. Out of the change of station frequencies have come several problems for servicemen. Three of these problems give excellent follow-up opportunities. To help you make these follow-ups we have prepared three stamped postal cards which are illustrated on Page 3 in the main section of this News. The three postal cards cover the following problems:

910KC HETERODYNES: The reallocation of stations resulted in placing several U. S. stations in the 910 Kc channel which heretofore U. S. stations had never used. In the cities and surrounding territories serviced by these 910 Kc stations, heterodyning will give trouble in many receivers.

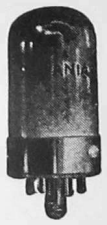
A great number of radio receivers use an i-f peak of 455 Kc. The first harmonic of 455 Kc is 910 Kc, the same frequency as the new U. S. channel. It is obvious that when a station signal of 910 Kc is tuned in on these receivers a heterodyne will be heard which will ruin or impair reception. If the i-f peak is slightly off resonance, a heterodyne may be heard on the channel above or below 910 Kc, that is, at 920 or 900 Kcs.

To correct receivers having i-f peaks of 455 and giving this trouble, all that is necessary is to move the i-f peak to another position. In most cases a shift to an i-f peak of 445 or 465 will be satisfactory. When making such shifts a complete realignment of the receiver should be made.

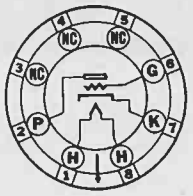
1500 TO 1600 KCS: Before the reallocation there were very few stations above 1500 Kc and for this reason many receivers were designed not to tune higher than this frequency. With the shift on March 29th, many stations were moved into the channels between 1500 and 1600 Kc. This means that there are many service jobs waiting for servicemen. Owners of receivers tuning only to 1500 Kc will want their sets changed so as to pick up these higher frequencies, particularly those set owners in cities and surrounding territories where their stations have been moved above 1500 Kc. Changes may be necessary in the receiver circuit, but in most cases satisfactory higher tuning can be obtained by shifting the antenna trimmers as well as the oscillator and r-f trimmers.

PHONO OSCILLATOR BIRDIES: Frequency setting for wireless record players is always made at some frequency where heterodynes or "birdies" are not bothersome. With the shift in stations there are now many wireless record players with their frequency settings on or near enough to a station frequency so that the owner is having trouble. This is especially true for those players adjusted for operation above 1500 Kc, now that there are several stations located above that frequency. To correct the trouble, all that is necessary is to change the frequency setting for the phono oscillator. It goes without saying that in making these changes the receivers should also be given a good check up.

# NEW TUBES



## Sylvania Type 14A4 Triode Amplifier




5-AC

Sylvania Type 14A4 is a "Lock-In" super-triode amplifier detector having electrical characteristics and applications the same as those for Type 7A4, except for the heater ratings. The tube design is such that it is especially applicable to ultra high frequency equipment.

The "Lock-In" construction employed in Type 14A4 provides compactness, suitable shielding, and the lock-in feature. For a-c service the 14-volt heater corresponds to a 130-volt line condition.

### CHARACTERISTICS

| | |
|---|---|
| Heater Voltage (Nominal) AC or DC | 14.0 Volts |
| Heater Current (Nominal) | 0.160 Ampere |
| Bulb | T9-G |
| Base—"Lock-In" 8-Pin | 5-AC |
| Mounting Position | Any |
| **Direct Interelectrode Capacitances:*** | |
| Grid to Plate | 4.0 μμf |
| Grid to Cathode | 3.4 μμf |
| Plate to Cathode | 3.0 μμf |

*With Standard RMA Tube Shield connected to Cathode

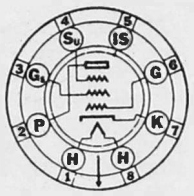
**RATINGS:**

| | |
|---|---|
| Heater Voltage (Nominal) AC or DC | 14.0 Volts |
| Heater Current (Nominal) | 0.160 Ampere |
| Plate Voltage | 300 Volts Max. |
| Plate Dissipation | 2.5 Watts Max. |
| External Grid Bias Voltage | 0 Volt Min. |

**Operating Conditions and Characteristics:**

| | Class A Amplifier | |
|---|---|---|
| Heater Voltage | 12.6 | 12.6 Volts |
| Heater Current | 0.150 | 0.150 Ampere |
| Plate Voltage | 90 | 250 Volts |
| Grid Voltage | 0 | −8 Volts |
| Plate Current | 10 | 9 Ma. |
| Plate Resistance | 6,700 | 7,700 Ohms |
| Mutual Conductance | 3,000 | 2,600 μmhos |
| Amplification Factor | 20 | 20 |

## Sylvania Type 14A7/12B7 Triple Grid Amplifier




8-V

Sylvania Type 14A7/12B7 is a "Lock-In" triple grid super-control amplifier suitable for r-f or i-f service in a-c, ac-dc and aircraft service.

All of the grids terminate at the base pins, thus providing a super-control amplifier tube without a top cap. An internal cage-like shield connected to pin number 5, is effective in providing a small grid to plate capacity.

The electrical characteristics and applications of Type 14A7/12B7, except for heater ratings, are the same as those for Type 7A7.

### CHARACTERISTICS

| | |
|---|---|
| Heater Voltage (Nominal) AC or DC | 14.0 Volts |
| Heater Current (Nominal) | 0.160 Ampere |
| Bulb | T9-G |
| Base—"Lock-In" 8-Pin | 8-V |
| Mounting Position | Any |
| **Direct Interelectrode Capacitances:*** | |
| Grid to Plate | 0.005 μμf Max. |
| Input: Grid to (F+K+G₂+G₃) | 6.0 μμf |
| Output: Plate to (F+K+G₂+G₃) | 7.0 μμf |

*With Standard RMA Tube Shield connected to Cathode

**RATINGS:**

| | |
|---|---|
| Heater Voltage (Nominal) AC or DC | 14.0 Volts |
| Heater Current (Nominal) | 0.160 Ampere |
| Plate Voltage | 300 Volts Max. |
| Screen Voltage | 125 Volts max. |
| Plate Dissipation | 4.0 Watts Max. |
| Screen Dissipation | 0.4 Watt Max. |
| External Grid Bias Voltage | 0 Volt Min. |

**Operating Conditions and Characteristics:**

| | | |
|---|---|---|
| Heater Voltage | 12.6 | 12.6 Volts |
| Heater Current | 0.150 | 0.150 Ampere |
| Plate Voltage | 100 | 250 Volts |
| Screen Voltage | 100 | 100 Volts |
| Grid Voltage | −1 | −3 Volts Min. |
| Suppressor and Internal Shield | 0 | 0 Volt |
| Plate Current | 13 | 9.2 Ma. |
| Screen Current | 4.0 | 2.6 Ma. |
| Plate Resistance | 0.12 | 0.8 Megohm |
| Mutual Conductance | 2350 | 2000 μmhos |
| Grid Voltage for Mutual Conductance of 10 μmhos | −35 | −35 Volts |

# A CHAT WITH ROGER WISE

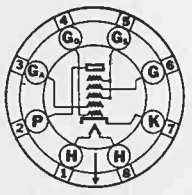
Chief Tube Engineer
Hygrade Sylvania Corporation

Those who had experience along radio lines in World War I after the entry of the United States into the conflict will appreciate the contrast between radio tubes available then and those available at this time for use in connection with National Defense Projects. The contrast is sharp as regards diversity of types, the ease with which almost unlimited quantities can be delivered, and also in the matter of tube life.

In 1917 the tube production of the country was a matter of a few thousand tubes per year—now one hundred million is a normal year's production, and subject to a quite rapid increase upon fairly short notice. Machine operations at high speed replace laborious hand operations, with consequent savings and with improved uniformity. The increase in filament efficiency is startling, while mutual conductance or transconductance per milliampere of plate current is also stepped up to levels unthought of twenty-five years ago.

The tube industry as a whole is ready to serve National Defense needs as called upon, and is already contributing steadily to the program as worked out to date. Later this progress will be a stimulus to new developments in the commercial field, just as the previous war laid the foundation for tremendous progress in the 1920 to 1940 era of radio.

## Sylvania Type 14B8 Pentagrid Converter




8-X

Sylvania Type 14B8 is a "Lock-In" converter tube designed for service in a-c, ac-dc and aircraft receivers. Compactness, short connections to the electrodes and simplified shielding are some of the features of this tube. The electrical characteristics and circuit applications are the same as those for Type 7B8, except for heater rating.

### CHARACTERISTICS

| | |
|---|---|
| Heater Voltage (Nominal) AC or DC | 14.0 Volts |
| Heater Current (Nominal) | 0.160 Ampere |
| Bulb | T9-G |
| Base—"Lock-In" 8-Pin | 8-X |
| Mounting Position | Any |
| **Direct Interelectrode Capacitances:*** | |
| Grid G to Plate | 0.2 μμf Max. |
| Grid G to Grid Ga | 0.2 μμf Max. |
| Grid G to Grid Go | 0.2 μμf Max. |
| Grid Go to Grid Ga | 0.90 μμf |
| Grid G to all Electrodes (R-F Input) | 10.0 μμf |
| Grid Ga to all Electrodes except Go (Osc. Output) | 3.4 μμf |
| Grid Go to all Electrodes except Ga (Osc. Input) | 5.0 μμf |
| Plate to all Electrodes (Mixer Output) | 9.0 μμf |

*With standard RMA Tube Shield connected to Cathode

**RATINGS:**

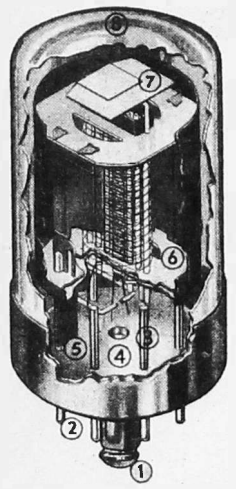
| | |
|---|---|
| Heater Voltage (Nominal) AC or DC | 14.0 Volts |
| Heater Current (Nominal) | 0.160 Ampere |
| Plate Voltage | 300 Volts Max. |
| Screen Voltage | 100 Volts Max. |
| Anode Grid Voltage | 200 Volts Max. |
| Total Cathode Current | 14 Ma. Max. |
| External Signal Grid Bias Voltage | 0 Volt Min. |

**Operating Conditions and Characteristics:**

| | | |
|---|---|---|
| Heater Voltage | 12.6 | 12.6 Volts |
| Heater Current | 0.150 | 0.150 Ampere |
| Plate Voltage | 100 | 250 Volts |
| Screen Voltage | 50 | 100 Volts |
| Anode Grid Voltage | 100 | 250** Volts |
| Control Grid Voltage (G) | −1.5 | −3.0 Volts |
| Oscillator Grid Resistor (Go) | 50,000 | 50,000 Ohms |
| Plate Current | 1.1 | 3.5 Ma. |
| Screen Grid Current | 1.3 | 2.7 Ma. |
| Anode Grid Current | 2.0 | 4.0 Ma. |
| Oscillator Grid Current | 0.25 | 0.4 Ma. |
| Cathode Resistor | 300 | 300 Ohms |
| Plate Resistance | 0.6 | 0.36 Megohm |
| Conversion Conductance | 360 | 550 μmhos |
| Control Grid Voltage (Approximate) | | |
| For 6 μmhos Conversion Conductance | .... | −35 Volts |
| For 3 μmhos Conversion Conductance | −20 | .... Volts |

**Applied through 20,000 ohm dropping resistor

(New Tubes Continued on page 4)



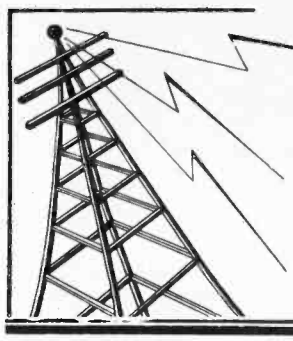
## 9 REASONS why "Lock-In" Tubes can "Take It"

●Compact and efficient with the modern "Lock-In" feature, the Sylvania "Lock-In" Tube is today's outstanding development in radio tubes. Details of construction originated for these types are highlighted here:

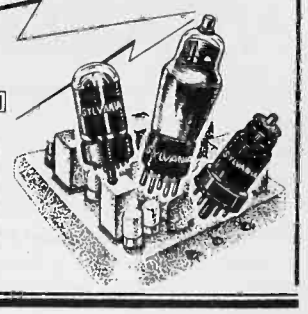
1. **"Lock-In" Locating Lug . . .** also acts as shield between pins.
2. **No Soldered Connections . . .** all welded for greater durability.
3. **Short, Direct Connections . . .** fewer welded joints—less loss.
4. **All-Glass Header . .** low loss and better spacing of lead wires.
5. **No Glass Flare . . .** unobstructed space for internal shielding.
6. **Improved Mount Support . . .** ruggedly mounted on all sides.
7. **Getter Located on Top . . .** shorts eliminated by separation of getter material from leads.
8. **No Top Cap Connection . . .** overhead wires eliminated.
9. **Reduced Overall Height . . .** space saving.

**WORKING FOR UNCLE SAM NOW?**

**Servicemen who are drafted for army duty, or who join any branch of Government service, may continue to receive Sylvania News during enlistment. Drop us a post card giving both your old and new address.**



# The SERVICE EXCHANGE



THE information presented in the Sylvania Service Exchange is contributed by service men as the result of practical experience. It is very carefully considered before being accepted, and we believe it to be correct and authentic. However, we assume no responsibility with respect to results. Each hint accepted entitles the writer to his choice of one Sylvania receiving tube. Please indicate preference when submitting hints. Don't send routine or generally known information. Please specify tube choice.

**Alignment of F-M Receivers:**

For a quick, accurate, foolproof adjustment of the secondary trimmer of the discriminator in F-M receivers, I do the following After aligning the receiver, adjust the secondary discriminator trimmer for maximum noise. I found after considerable experience that this method of adjusting the secondary trimmer discriminator, while it may be extremely critical in some sets, depending upon the L/C ratio of disc, resulted in a symmetrical distribution on each side of resonance when the main tuning gang condenser is varied around the resonant point of the tuned-in F-M station.—Peter Rice, Chicago, Ill.

* * *

**Hallicrafter Model S31.** Alignment and service data is difficult to follow for the FM band of this receiver and takes too much time to complete. To align the 4.3 mc i-f transformers, connect signal generator to center of small stator section of the tuning condenser, having first loosened the 200,000 ohm resistor from contact No. 5 of the 6SJ7 limiter tube and inserted an 0-200 micro-ammeter in series with the resistor and cathode. Using a strong signal from generator tune the transformers T3, T2, T1, in that order for maximum deflection. Do not return to a transformer once it is set.

A number of these receivers show bad quality on loud audio passages on the FM band. This is due to poor alignment of transformer T4, the discriminator. Correct cross-over is not necessarily obtainable at 4.3 mc but at some different frequency, best determined by trial. If it is necessary to realign T4, then the same intermediate frequency, giving correct cross-over, must be used to trim up T1, T2, and T3.

In close promixity to a strong FM station even perfect alignment of the receiver will not eliminate poor FM quality. This is caused by too much a-v-c voltage developed by high limiter current, (in excess of 40 micro-amperes). Remove the a-v-c lead from the 100,000 ohm resistor R19 and ground the a-v-c lead. This is highly recommended practice in any case, as a v-c is best omitted from a well designed FM receiver. None of the above changes in any way affects the performance of the AM band, but all yield a noticeable improvement in the FM performance of these receivers.—Llewellyn Bates Keim, White Plains, N.Y.

* * *

**Majestic Model 44.** I find that in this receiver or subsequent Majestic-Grigsby Grunow radios, there is a hum or whistle which can be eliminated by checking and replacing the filters. The whistle can be taken out by changing the .01 mfd. condenser on the power switch to a .02 mfd. I have found this trouble several times in the same model radio. J. Gladieur, Toledo, Ohio.

* * *

**Philco Models PT-2, 4, 6, 8.** I have had several of these new Philco sets on which the dial slips after a few days service. Both ends of the dial cable are secured by one spring on the large pulley. A good repair is to remove the end of the cable, which runs completely around the pulley, from the spring and secure it to a piece of No. 16 solid wire which has been soldered to the inside of the pulley.—Earl W. Hosler, Mt. Sterling, Ohio.

* * *

**Philco Battery Receivers.** In Philco 1.4 volt sets distortion and motorboating are sometimes noticeable and it is necessary to bypass the resistor between A- and B-, though no condenser is used originally. An 0.1 mfd. condenser is large enough to do the trick.—Edwin J. Lark, Miller, Mo.

* * *

**Philco (Late Models).** An unusual trouble and one difficult to locate has been encountered in the late model Philco receivers with built-in antennae. The set will develop a lot of interference on dialing, which does not appear on the push buttons. This trouble has been traced to the dial light on the dial switch which is turned on and off by the band switch. The dial light leads run by the first r-f coil. The cure is a new light. Be sure that it makes a good connection. Chas. O. Massie, Vinita, Okla.

* * *

**RCA Victor Models 10K, 10T.** If sensitivity of these models seems low on all five bands, check the bias switch, S7 in the service diagram. The purpose of this switch is to increase sensitivity on the short and intermediate wave bands by reducing the residual bias on the a-v-c and detector tubes, and is operated by the range selector control switch. When this switch is turned clock-wise it may stop in one position and stick there causing a decrease in sensitivity. To remedy, clean the contact points of this switch and lubricate the movable parts.—Fred Karpen, Johnstown, Penna.

* * *

**RCA Models 96K, 96T2.** These sets sometimes develop a very peculiar distortion after they have run for fifteen or twenty minutes. It is most noticeable on speech and very often is thought to be in the 1st. audio tube. The trouble lies in the Resistor No. 12, which is a 390 ohm unit and should be replaced with just this value.—Lynn D. Smith, Albion, Neb.

* * *

**RCA Model U-125.** I have found that when the phono motors begin to vary in speed, the trouble is due to the fact that the thrust bearings of these motors are made of fiber. These bearings wear down quite easily and then the trouble begins. Remove the bearings completely and grind the fiber off the end of the bearings. Be very careful with this however, because the metal part of the bearing under the fiber contains a small pitted place which will act as a bearing against the ball. After this is done replace and adjust the speed of the motor. If a slight interference is heard from the motor, grounding the motor to the chassis will eliminate it.—Leonard H. Johnson, South Boston, Va.

* * *

**Scott Custom Built Receiver.** Some of these sets use voltage regulator tubes which tend to oscillate under certain conditions. Shunt an 0.5 mfd. condenser from the high voltage lead of the regulator to ground.—Geo. Radio Service, Elizabeth, N. J.

* * *

**Silver Marshall Model Z.** This set uses a type 82 rectifier with choke input to the filter. In some cases the 82 has been found blown and the logical suspect was a shorted electrolytic. A new 700 volt unit should be used to replace a blown one and a new type 82 used. If the electrolytic begins to heat up and the wax runs out, a shorted .015 paper condenser across the filter choke is the cause. Parallel connected .01 and .005 condenser units will replace this odd size and should be used, as this is a tuned filter circuit. Always check the complete filter circuit when a rectifier tube is found blown.—Don Doxtader, East Hehimer, N. Y.

* * *

**Sky King Portable—Battery Model.** When this receiver is dead with voltages normal and everything checks good, yet it will not oscillate, change the .02 condenser on the oscillator grid (1A7G). This condenser must be removed and replaced—don't try bridging.—J. L. Torrito, Ambridge, Penna.

* * *

**Speaker Plugs.** Sets with speaker plugs sometimes have loose plug contacts. When contacts open, a voltage surge due to the field inductance breaks down the filter condenser. One set owner to my knowledge lost 4 condensers before the cause was found.—Edwin J. Lark, Miller, Mo.

* * *

**Stewart-Warner Model 01-5H.** If the screen of the 6F6G output glows brightly, check the output transformer. I have had several sets with this defect and quickly found it by this method. Also check the dual electrolytic (14-10 mfd.) and coupling for leakage or shorts.—Isadore Hyman, Norfolk, Va.

* * *

**Trav-Ler Model 466M.** If this set hums on low volume, but is OK on loud volume, connect a jumper wire from ground to the ground side of the a-c switch. The switch was formerly grounded through the shaft by connection on side of the switch.—Leonard J. Aurzada, Wadena, Minnesota.

* * *

**Zenith Models 6M192, 6M193, 6M194.** If these sets are very noisy when jarred, check the i-f shields which are grounded through an eye bolt on the can. Solder the ground lead to the cross bar, on top of the can, making sure the nuts holding this are tight. Also check the soldering lugs on the tuning gang stator for good contact.—Geo. Baer, Roslindale, Mass.

* * *

**Zenith Model 5808, 1005, 1103.** Oscillation at 550 k-c can be traced to improper adjustment of the wave trap. The cure is to realign the trap. Noisy tuning is noticed when the braid on the condenser gang rubs on the fly wheel burs, shorting to the volume control.—Geo. Radio Service, Elizabeth, N. J.

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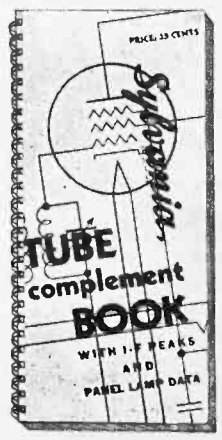


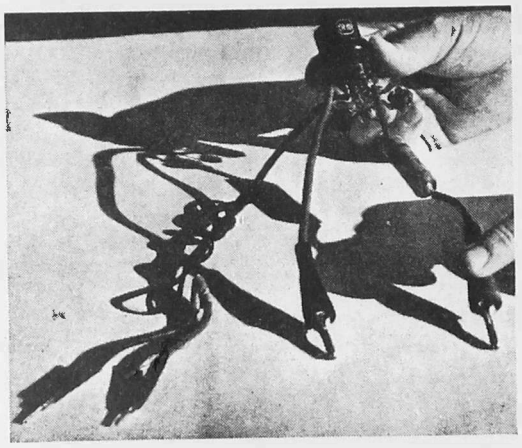

## TUBE COMPLEMENT BOOK READY NOW

Due to the rush of orders for Station allocation change material, shipment of the new Tube Complement Books has been slightly delayed. They are now being mailed. Servicemen who have not ordered should do so without delay, as there is every indication that the first edition will soon be sold out. Use the coupon on page 3, Main Section, or buy from your Sylvania Jobber.

# A Signal Intercepter

For some time I have been using a simple tester that provides for a complete check of the signal as it passes through the different stages in a radio. This tester is so compact that it and the four 1½ volt cells can be carried in one's pocket. For the majority of troubles it will act as a time saver and should prove as helpful to other servicemen as it has to me.

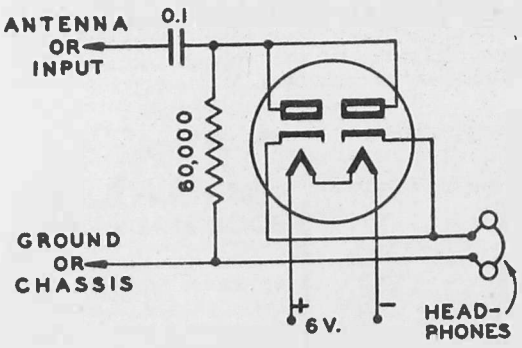
A Sylvania 6H6 metal tube is used as a diode detector, the only power supply required being 6 volts to light the tube's filament. To use, remove the grid lead wire from the tube in the first stage to be tested which is usually the first r-f or first detector oscillator. Connect the lead marked antenna in the diagram to the grid lead which has just been removed from the tube in the radio. Connect the lead marked ground to the chassis of the radio. Headphones are then plugged into phone jacks, soldered to the cathode and ground terminals of the 6H6 tube socket. Wires connect the filament of the 6H6 tube to the battery by means of phone tips and jacks.



With this set-up, we have a tuned detector stage, the signal coming in through the radio antenna connection, tuned by the tuned stage and detected by the 6H6 diode detector. Any fading, intermittent or noisy signal will be evident in the earphones. Dead stages and distortion will also be immediately located.

As we work on back through the radio, signal volume will increase as more stages are added ahead of the detector unit, as a drop in signal strength would indicate that the stage ahead of the "Signal Interceptor" was defective if it was an amplifier stage.

Tests have shown that the unit will work very satisfactorily on signals coming from broadcasting stations located within 100 to 150 miles. P. M. Ohlinger, Portsmouth, Iowa.



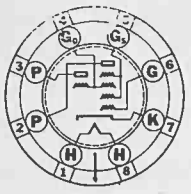

### LIST OF PARTS

1—.1 mfd. tubular condenser
1—600,000 ohm ¼ watt resistor
4—1½ volt flashlight cells
1—Sylvania 6H6 metal tube
1—Pair headphones
4—Phone jacks
2—Phone tips, or plugs
1—Octal socket
2—Alligator clips
Hook-up wire

# NEW TUBES

(Continued from page 2)

## Sylvania Type 14J7 Triode-Hexode Converter




Sylvania Type 14J7 is a "Lock-In" converter tube consisting of a triode unit and hexode unit in a single bulb. The cathode is common to both units. This tube is essentially the combination of the well known triode-oscillator and separator detector, and is the same as Type 7J7 except for heater rating.

Type 14J7 provides true electron coupling since the grid of the triode section is connected to an injector grid in the mixer section. The high plate resistance of this tube results in very low plate loading, making it possible to use highly efficient i-f transformers to advantage. Compared to most other existing types of converter tubes, Type 14J7 has lower frequency drift which is an attractive feature. Because of this high frequency stability it should be possible to reduce the filtering in the oscillator plate and not encounter the "fluttering" found in most other converters.

It will be noted that the two plates and the hexode screen-grids are operated at the same d-c potential when using 100 volts. Thus, the screen-grid dropping resistor required with previous converters may be eliminated.

For a-c service the 14-volt heater rating corresponds to a 130-volt line condition.

### CHARACTERISTICS

| | |
|---|---|
| Heater Voltage (Nominal) AC or DC | 14.0 Volts |
| Heater Current (Nominal) | 0.160 Ampere |
| Bulb | T9-G |
| Base—"Lock-In" 8-Pin | 8-AR |
| Mounting Position | Any |

**Direct Interelectrode Capacitances:***

| | |
|---|---|
| Grid G to Hexode Plate | 0.01 μμf Max. |
| Grid G to Triode Plate | 0.1 μμf Max. |
| Grid G to Grid Go | 0.2 μμf Max. |
| Grid Go to Triode Plate | 1.0 μμf |
| Grid G to all Electrodes (R-F Input) | 5.5 μμf |
| Triode Plate to all other Electrodes Except Grid Go (Osc. Output) | 2.0 μμf |
| Grid Go to all other Electrodes Except Oscillator Plate (Osc. Input) | 8.5 μμf |
| Hexode Plate to all other Electrodes (Mixer Output) | 7.5 μμf |

*With standard RMA Tube Shield connected to Cathode

**RATINGS:**

| | |
|---|---|
| Heater Voltage (Nominal) AC or DC | 14.0 Volts |
| Heater Current (Nominal) | 0.160 Ampere |
| Hexode Plate Voltage | 300 Volts Max. |
| Hexode Screen Voltage | 100 Volts Max. |
| Hexode Screen Supply Voltage | 300 Volts Max. |
| Hexode Control Grid (G) Voltage | 0 Volt Min. |
| Triode Plate Voltage | 150 Volts Max. |
| Triode Plate Supply Voltage | 300 Volts Max. |
| Triode Plate Dissipation | 1.0 Watt Max. |
| Total Cathode Current | 14 Ma. Max. |

### Operating Conditions and Characteristics:

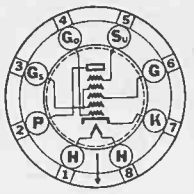
| | | |
|---|---|---|
| Heater Voltage | 12.6 | 12.6 Volts |
| Heater Current | 0.150 | 0.150 Ampere |
| Hexode Plate Voltage | 100 | 250 Volts |
| Hexode Grid Voltage | −3 | −3 Volts |
| Hexode Screen Voltage | 100 | 100 Volts |
| Hexode Plate Current | 1.1 | 1.3 Ma. |
| Hexode Screen Current | 3.1 | 2.9 Ma. |
| Hexode Plate Resistance | 0.3 | 1.5 Megohms |
| Conversion Conductance | 260 | 300 μmhos |
| Triode Plate Voltage (Oscillator) | 100 | 250# Volts |
| Triode Grid Resistor (Oscillator) | 50,000 | 50,000 Ohms |
| Triode ulate Current (Oscillator) | 3.7 | 5.4 Ma. |
| Triode Grid Current (Oscillator) | 0.3 | 0.4 Ma. |
| Conversion Conductance: At Hexode Grid Voltage of −20 | 2 | 2 μmhos |

#Applied through 20,000 ohm dropping resistor properly by-passed.

**Triode Section Only**

| | |
|---|---|
| Plate Voltage | 150 Volts Max. |
| Grid Voltage | −3 Volts |
| Plate Current | 7.5 Ma. |
| Plate Resistance | 10,400 Ohms |
| Mutual Conductance (Approx.) | 1,350 μmhos |
| Amplification Factor (Approx.) | 14 |

## Sylvania Type 14Q7 Pentagrid Converter




Sylvania Type 14Q7 is a "Lock-In" pentagrid converter, the equivalent of Type 7Q7. It also is quite similar to Type 12SA7. The circuit applications are the same as those for Type 7Q7 and parallel those of other Sylvania pentagrid converters.

### CHARACTERISTICS

| | |
|---|---|
| Heater Voltage (Nominal) AC or DC | 14.0 Volts |
| Heater Current (Nominal) | 0.160 Ampere |
| Bulb | T9-G |
| Base—"Lock-In" 8-Pin | 8-AL |
| Mounting Position | Any |

**Direct Interelectrode Capacitances:***

| | |
|---|---|
| Grid G to Plate# | 0.10 μμf Max. |
| Grid Go to G# | 0.15 μμf Max. |
| Grid Go to Plate# | 0.06 μμf Max. |
| Grid Go to all other Electrodes and Base Shell# | 7.0 μμf. |
| Grid Go to all other Electrodes and Base Shell except Cathode | 4.8 μμf |
| Grid Go to Cathode | 2.2 μμf |
| Grid G to all other Electrodes and Base Shell (R-F Input)# | 9.5 μμf |
| Plate to all other Electrodes and Base Shell (Mixer Output)# | 9.0 μμf |
| Cathode to all other Electrodes and Base Shell except Grid Go | 5.0 μμf |

*With standard RMA tube shield connected to base shell
#With base shell connected to cathode

**RATINGS:**

| | |
|---|---|
| Heater Voltage (Nominal) AC or DC | 14.0 Volts |
| Heater Current (Nominal) | 0.160 Ampere |
| Plate Voltage | 300 Volts Max. |
| Screen Voltage | 100 Volts Max. |
| Screen Supply Voltage | 300 Volts Max. |
| Total Plate and Screen Dissipation | 2.0 Watts Max. |
| Screen Dissipation | 1.0 Watt Max. |
| Total Cathode Current | 14 Ma Max. |
| Signal-Grid External Bias Voltage (with self-excited oscillator) | 0 Volt Min. |

### Operating Conditions and Characteristics:

Converter (Separately Excited)

| | | |
|---|---|---|
| Heater Voltage | 12.6 | 12.6 Volts |
| Heater Current | 0.150 | 0.150 Ampere |
| Plate Voltage | 100 | 250 Volts |
| Screen Voltage | 100 | 100 Volts |
| Control Grid Voltage** (G) | −2 | −2 Volts |
| Suppressor Grid and Shield Voltage | 0 | 0 Volt |
| Oscillator Grid Resistor (Go) | 20,000 | 20,000 Ohms |
| Plate Resistance (Approx.) | 0.5 | 1.0 Megohm |
| Oscillator Grid Current | 0.5 | 0.5 Ma. |
| Plate Current | 3.3 | 3.5 Ma. |
| Screen Current (Gs) | 8.5 | 8.5 Ma. |
| Total Cathode Current | 12.3 | 12.5 Ma. |
| Conversion Conductance at Ec3—.2 | 425 | 450 μmhos |
| Conversion Conductance at Ec3—.6 | 310 | 325 μmhos |
| Conversion Conductance at Ec3—.10 | 75 | 80 μmhos |
| Conversion Conductance at Ec3—.35 (Approx.) | 5 | 5 μmhos |

**Characteristics for self excitation are similar to those given for separate excitation except the control grid (Grid G bias voltage is 0 volt).

Note: With Grid Gs connected to plate (100 volts) and signal applied to Grid Go (0 volt bias), the Conversion Conductance is 4500 μmhos, plate current 27 Ma., amplification factor 13. Grid G is connected to ground during the test.

• • •

# To Unlock the "Lock-In" Tube

Many servicemen may not be familiar with the simple method used in unlocking the "Lock-In" tube, in which case they will verify that the word "Lock-In" means all that it says. When the locating lug of the "Lock-In" tube is inserted into the socket key-way, it is engaged by a spring catch which securely fastens it to the socket. With a tight locking socket, it is almost impossible to remove the tube by a direct upward pull without great effort and a strain on the socket mechanism.

To remove a "Lock-In" tube with ease, a slight offside pressure on the tube, by pushing it with the thumb on the side of the bulb, will unsnap the locking arrangement and permit easy removal.

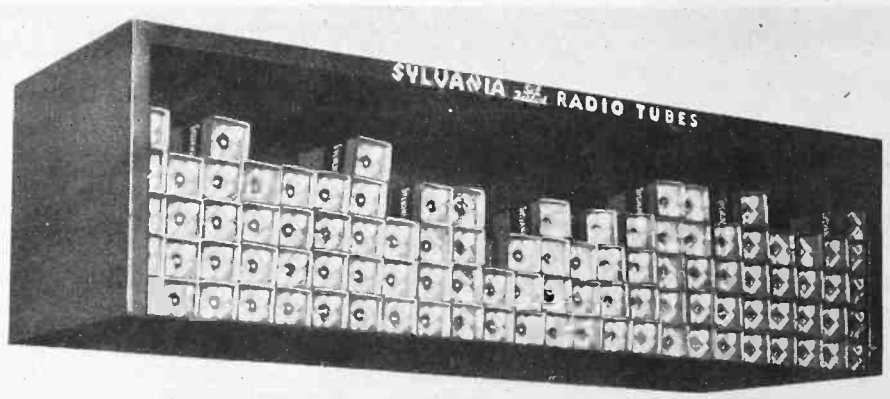
# SYLVANIA NEWS

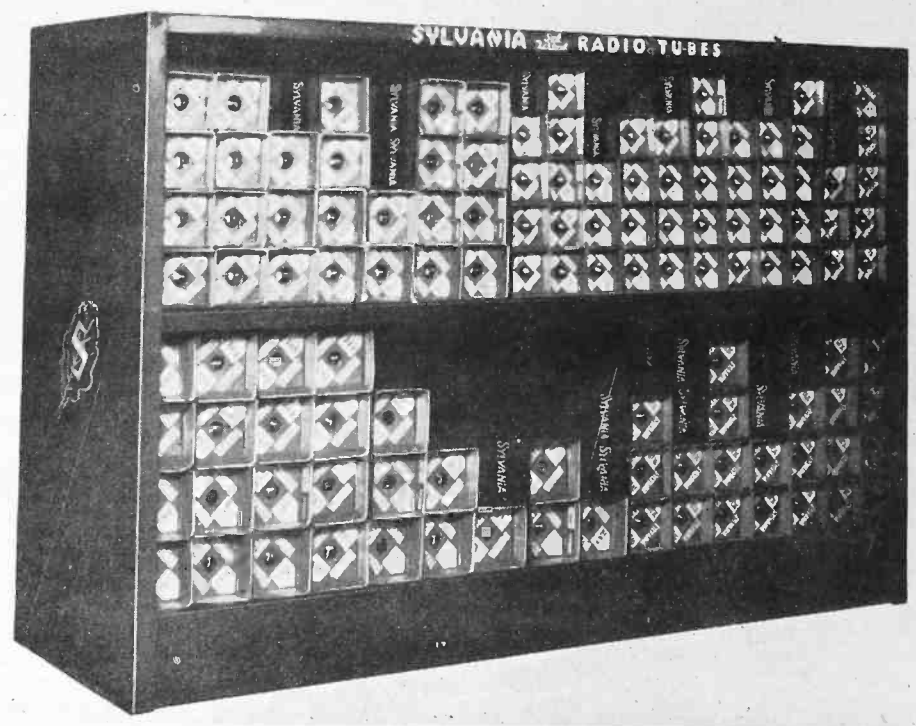
TECHNICAL SECTION




MAY-JUNE, 1941 EMPORIUM, PENNA. Vol. 9, No. 3

# PLAN YOUR STORAGE SPACE WITH ADD-A-UNIT STOCKBOY




**The new open shelf Stockboy, with Add-A-Unit sections, is the answer to your stock storage problem, whether you need just a little extra space, or are planning a whole new layout. Starting with the two-shelf base, the illustration shows how the extra units are added as you need them.**

**Do you need a handy place to keep the tubes you need at your service bench, or a counter tube display, or a couple of extra shelves? The base unit fills your need. . . . Have you been keeping your tube stock where it is hard to get at and hard to inventory? Plan a new, convenient flexible storage cabinet, using as many units as you need to keep your stock always accessible and in good condition.**

**The convenient Add-A-Unit sections are easy to stack, easy to move. If you are planning changes in your shop layout, forget expensive built-in shelves. Simply move the required number of units into place.**

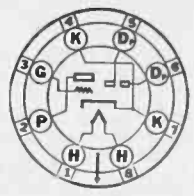
**The Sectional stockboy is made of heavy gauge steel, with all joints welded for permanent strength. Surface is coated with best grade of rich olive-green enamel—will not crack, peel or chip. Knobs in corners of shelf bottoms fit snugly into recesses on top of base units or additional shelves. Units can be piled from floor to ceiling, and each one will stay firmly in place, and in perfect alignment.**

**Base units, consisting of two shelves, measure 34 inches wide by 22½ inches high by 12 inches deep. Additional Add-A-Unit shelves same width and depth, 9¾ inches high. Each shelf holds from 130 to 420 tubes (depending on carton size).**

## TO ORDER SEE YOUR SYLVANIA JOBBER

# NEW TUBES

## Sylvania Type 14B6 Duodiode Triode




8-W

Sylvania Type 14B6 is a duodiode high-mu triode having electrical characteristics which are identical with those for Types 7B6 and 75, except for heater rating.

The diodes are substantially the same as those employed in other Sylvania duodiode high-mu triode types and therefore, may be employed in conventional circuit applications.

It may be noted from the base diagram that the cathode is connected to two contact pins, Numbers 4 and 7. Pin Number 4 is used as a mount support for the cathode, therefore the potential of pins 4 and 7 is the same.

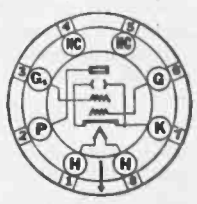
### CHARACTERISTICS

| | |
|---|---|
| Heater Voltage (Nominal) AC or DC | 14.0 Volts |
| Heater Current (Nominal) | 0.160 Ampere |
| Bulb | T9-G |
| Base—"Lock-In" 8-Pin | 8-W |
| Mounting Position | Any |
| **RATINGS:** | |
| Heater Voltage (Nominal) AC or DC | 14.0 Volts |
| Heater Current (Nominal) | 0.160 Ampere |
| Plate Supply Voltage | 300 Volts Max. |
| Current to each Diode with 10 Volts DC Applied | 0.8 Ma. Min. |

### Operating Conditions and Characteristics:

| | | |
|---|---|---|
| Heater Voltage | 12.6 | 12.6 Volts |
| Heater Current | 0.150 | 0.150 Ampere |
| Plate Voltage | 100 | 250 Volts |
| Grid Voltage | −1 | −2 Volts |
| Plate Current | 0.4 | 0.9 Ma. |
| Plate Resistance | 110,000 | 91,000 Ohms |
| Mutual Conductance | 900 | 1,100 μmhos |
| Amplification Factor | 100 | 100 |

## Sylvania Type 14C5 Power Amplifier




6-AA

Sylvania Type 14C5 is a beam power amplifier which provides high power output, power sensitivity, and efficiency with a low percentage of third and higher order harmonics. Except for heater rating, the electrical characteristics and applications are identical with those for Type 7C5. The Type 14C5 should prove very desirable in applications where heater and plate current must be maintained at a minimum.

The "Lock-In" construction provides compactness, suitable shielding and the special lock-in feature. For a-c service the 14-volt heater rating corresponds to a 130-volt line condition.

When fixed bias is employed the resistance in the grid circuit should not be greater than 0.05 megohm. With cathode bias the grid circuit resistance must not exceed 0.5 megohm.

(Continued on next page)

# NEW TUBES

(Continued from page 1)

**TYPE 14C5—Continued**

### CHARACTERISTICS

| | |
|---|---|
| Heater Voltage (Nominal) ACorDC | 14.0 Volts |
| Heater Current (Nominal) | 0.240 Ampere |
| Bulb | T9-F |
| Base—"Lock-In" 8-Pin | 6-AA |
| Mounting Position | Any |

**RATINGS:**

| | |
|---|---|
| Heater Voltage AC or DC | 14.0 Volts |
| Heater Current | 0.240 Ampere |
| Plate Voltage | 315 Volts Max. |
| Screen Voltage | 285 Volts Max. |
| Plate Dissipation | 12 Watts Max. |
| Screen Dissipation | 2 Watts Max. |

### Operating Conditions and Characteristics:

Class A1 Amplifier (One Tube)

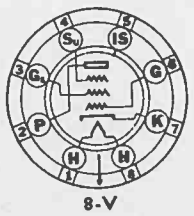
| | | | |
|---|---|---|---|
| Heater Voltage | 12.6 | 12.6 | 12.6 Volts |
| Heater Current | 0.225 | 0.225 | 0.225 Ampere |
| Plate Voltage | 180 | 250 | 315 Volts |
| Screen Voltage | 180 | 250 | 225 Volts |
| Grid Voltage | −8.5 | −12.5 | −13.0 Volts |
| Self-Biasing Resistor | 260 | 250 | 360 Ohms |
| Peak Input Signal | 8.5 | 12.5 | 13.0 Volts |
| Plate Current (Zero Signal) | 29 | 45 | 34 Ma. |
| Plate Current (Max. Signal) | 30 | 47 | 35 Ma. |
| Screen Current (Zero Signal) | 3.0 | 4.5 | 2.2 Ma. |
| Screen Current (Max. Signal) | 4.0 | 7.0 | 6.0 Ma. |
| Plate Resistance | 58,000 | 52,000 | 77,000 Ohms |
| Mutual Conductance | 3,700 | 4,100 | 3,750 μmhos |
| Load Resistance | 5,500 | 5,000 | 8,500 Ohms |
| Power Output | 2.0 | 4.5 | 5.5 Watts |
| Total Harmonic Distortion | 8 | 8 | 12 Per Cent |

Class AB1 Amplifier (Push-Pull)

(Values are for two tubes)

| | | |
|---|---|---|
| Heater Voltage | 12.6 | 12.6 Volts |
| Heater Current | 0.225 | 0.225 Ampere |
| Plate Voltage | 250 | 285 Volts |
| Screen Voltage | 250 | 285 Volts |
| Grid Voltage | −15 | −19 Volts |
| Peak Input Signal (Grid to Grid) | 30 | 38 Volts |
| Plate Current (Zero Signal) | 70 | 70 Ma. |
| Plate Current (Max. Signal) | 79 | 92 Ma. |
| Screen Current (Zero Signal) | 5 | 4 Ma. |
| Screen Current (Max. Signal) | 13 | 13.5 Ma. |
| Plate Resistance | 60,000 | 65,000 Ohms |
| Mutual Conductance | 3,750 | 3,600 μmhos |
| Load Resistance (Plate to Plate) | 10,000 | 8,000 Ohms |
| Power Output | 10.0 | 14.0 Watts |
| Total Harmonic Distortion | 5 | 3.5 Per Cent |

## Sylvania Type 14C7 Triple Grid Amplifier



8-V

Sylvania Type 14C7 is a "Lock-In" sharp cut-off r-f pentode with electrical characteristics similar to those for Type 7C7 and 6W7G. The circuit applications parallel those for other sharp cut-off pentodes such as Type 7C7, 6W7G and 77.

### CHARACTERISTICS

| | |
|---|---|
| Heater Voltage (Nominal) AC or DC | 14.0 Volts |
| Heater Current (Nominal) | 0.160 Ampere |
| Bulb | T9-G |
| Base—"Lock-In" 8-Pin | 8-V |
| Mounting Position | Any |
| Direct Interelectrode Capacitances:* | |
| Grid to Plate ($G_1$ to P) | 0.007 μμf Max. |
| Input: $G_1$ to (F+K+Gs+Su+Shield) | 6.0 μμf |
| Output: P to (F+K+Gs+Su+Shield) | 6.5 μμf |

*With Standard RMA Tube Shield connected to Cathode

**RATINGS:**

| | |
|---|---|
| Heater Voltage (Nominal) AC or DC | 14.0 Volts |
| Heater Current (Nominal) | 0.160 Ma. |
| Plate Voltage | 300 Volts Max. |
| Screen Voltage | 100 Volts Max. |
| Plate Dissipation | 1.0 Watt Max. |
| Screen Dissipation | 0.1 Watt Max. |
| External Grid Bias Voltage | 0 Volt Min. |

### Operating Conditions and Characteristics:

| | | |
|---|---|---|
| Heater Voltage | 12.6 | 12.6 Volts |
| Heater Current | 0.150 | 0.150 Ampere |
| Plate Voltage | 100 | 250 Volts |
| Screen Voltage | 100 | 100 Volts |
| Grid Voltage | −1 | −3 Volts |
| Plate Current | 5.7 | 2.2 Ma. |
| Screen Current | 1.8 | 0.7 Ma. |
| Plate Resistance (Approx.) | 0.325 | 1.0 Megohms |
| Mutual Conductance | 2275 | 1575 μmhos |

# A CHAT WITH ROGER WISE

Chief Tube Engineer
Hygrade Sylvania Corporation

We frequently find that our efforts to improve the operating characteristics of radio tubes are limited by the tendency of dealers and servicemen to retain tests which they have found from experience are satisfactory in checking the condition of tubes of earlier design. This has been particularly noticeable when extreme economy of filament power and plate power are important items, as is the case in tubes designed to operate from dry batteries.

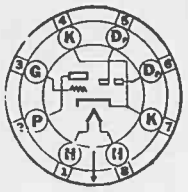
When the group of battery tubes designed to operate at 2.0 volts and 60 milliamperes was first introduced, some difficulty was experienced with false "shorts" in testers using neon lamps. The filament in this group of tubes is necessarily quite small and is mounted in the shape of an inverted "V", the filament tension hook being placed at the top in the conventional manner. When the tube is tested for shorts with the filament cold, a false indication can be readily obtained of the fact that the filament is mounted closer to the side of the grid nearest the filament hook support, thus reducing the clearance below normal. The voltage applied to the neon "short" indicator lamp exerts an electrostatic pull on the filament and may cause the filament to move over in contact with the grid long enough to cause the lamp to flicker. It is important to note that this same tube may operate normally with the filament lighted because the filament hook moves not only upwards, but also in a direction away from the hook support when the filament expands as it is brought up to normal operating temperature.

When the more efficient 1.4 volt, 50 milliampere battery tubes were introduced, the difficulty of checking with neon lamps became still greater. It is true that the "V" filament was replaced with a filament running straight through the electrode structures and held in exact alignment at top and bottom through contact with the mica spacing members at each point. With this construction the alignment of the filament is the same when it is cold as when it is hot; all side motion being prevented by contact with the mica spacer. It might be thought that this construction would make it practical to check these tubes with the conventional type of short checker and secure accurate results, but this is not the case. The clearance between grid and filament was reduced to such an extent to improve performance that it is possible for the filament to be pulled over against the grid momentarily by the voltage applied between these elements when subjected to the ordinary neon test. Quite frequently a flicker of the test lamp, which would normally indicate a short between grid and filament, occurs without its being evident that there has been any contact between grid and filament. The reason for this flickering is not certain, as it is very difficult to determine whether or not contact has occurred. On the other hand, repeated tests of tubes rejected because of slight flickering indication on the "short" lamp show that these tubes do not differ in operation from tubes which are passed as OK on the neon checker. It sometimes happens that a very large proportion of tubes shows this momentary "short" condition, and, as a result, tube manufacturers have decided that the test is not a reliable one. The alignment between grid and filament can be checked by applying a signal to the grid and determining whether or not the response in the plate circuit is normal.

If it were not for the urgent demand for maximum battery economy, it would be a simple matter for the tube designer to increase clearance to the point where the normal field test would be a satisfactory indication of the condition of the tube under test. On the other hand, there is a steady demand for further improvement of characteristics, and this means that there is no possibility of taking such a backward step with regard to spacing of the elements due to the fact that it brings with it a drop in performance to an extent which makes the tube unsatisfactory in terms of circuit performance.

One visual test which can be made by any serviceman is an examination of the top mica of a tube of this type. Close inspection of the mica will make it possible to see whether or not the filament comes through the apex of a "V" groove. As long as the filament lies in this "V" groove, there is little danger of a grid-filament short, but if it has jumped out of the groove for any reason, it is likely that the tube will be shorted. If desired this visual inspection can be supplemented by some form of operation test, as mentioned above.

## Sylvania Type 14E6 Duodiode Triode



8-W

Sylvania Type 14E6 is a "Lock-In" duodiode medium-mu triode with characteristics the same as those for the "Lock-In" 7E6, except for the heater rating. The circuit applications are the same as those for Type 7E6 and other similar duodiode medium-mu triodes such as Types 6R7G and 85. The diodes in Type 14E6 are well shielded from the triode section which insures freedom from interaction between the respective circuits.

### CHARACTERISTICS

| | |
|---|---|
| Heater Voltage (Nominal) AC or DC | 14.0 Volts |
| Heater Current (Nominal) | 0.160 Ampere |
| Bulb | T9-G |
| Base—"Lock-In" 8-Pin | 8-W |
| Mounting Position | Any |

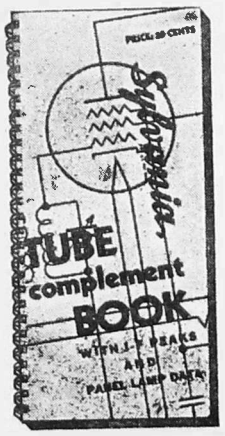
**RATINGS:**

| | |
|---|---|
| Heater Voltage (Nominal) AC or DC | 14.0 Volts |
| Heater Current (Nominal) | 0.160 Ampere |
| Plate Voltage | 250 Volts Max. |
| Plate Dissipation | 2.3 Watts Max. |
| Current to each Diode with 10 Volts DC Applied | 0.8 Ma. Min. |

### Operating Conditions and Characteristics:

| | | |
|---|---|---|
| Heater Voltage | 12.6 | 12.6 Volts |
| Heater Current | 0.150 | 0.150 Ampere |
| Plate Voltage | 100 | 250 Volts Max. |
| Grid Voltage | −3 | −9 Volts |
| Plate Current | 3.9 | 9.5 Ma. |
| Plate Resistance | 11,000 | 8,500 Ohms |
| Mutual Conductance | 1,500 | 1,900 μmhos |
| Amplification Factor | 16.5 | 16 |

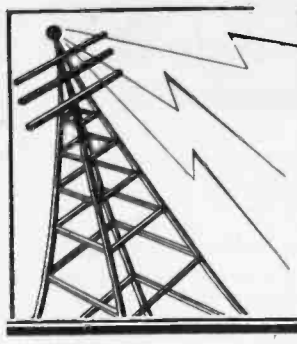
## Get It From Your Jobber



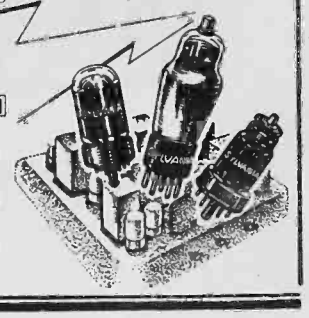

Sylvania jobbers now have a supply of the new Sylvania Tube Complement Book, price 35c.

This valuable book contains much information not available in handy form in any other publication. In its 272 pages will be found data on 16,730 radio models, under 586 trade names, made by 190 radio receiver manufacturers. Tube replacement information is given for 100,380 sockets. This compares with 168 pages, 10,386 models, 560 trade names, 560 manufacturers, and 75,000 sockets in the first edition.

The outstanding new feature is the addition of Panel Lamp Numbers for many models. While this is not 100% complete, due to difficulty in getting data on older receivers, it is the first time that this information has ever been compiled for servicemen. I-F Peak information has been increased, and is as nearly complete as our own research and the cooperation of set manufacturers can make it.



# The SERVICE EXCHANGE



THE information presented in the Sylvania Service Exchange is contributed by service men as the result of practical experience. It is very carefully considered before being accepted, and we believe it to be correct and authentic. However, we assume no responsibility with respect to results. Each hint accepted entitles the writer to his choice of one Sylvania receiving tube. Please indicate preference when submitting hints. Don't send routine or generally known information. Please specify tube choice.

**Delco 198777 (Pontiac) Models.** When the set is dead on the low end of the band and very weak on the high end, look for an open oscillator coil. The push-button plungers break the plate leads some way and the best repair is to replace with a new coil. We have had several sets with this defect lately.—Charles E. Williams, Jr., Long Beach, California.

* * *

**Dial Drive Shafts.** Here is a kink I found very useful in repairing some types of dial drive shafts. In some cable-drive assemblies, the shaft gets worn and loose. A new shaft can be made from an old volume control. Break off the resistor strip and bakelite, leaving only the shaft and mounting collar. Break off the contact arm and solder a small washer on the shaft to keep the dial cable from slipping off. In some cases the hole in the chassis has to be enlarged to fit this assembly.—M. J. Wroblenski, Niagara Falls, N. Y.

* * *

**Dodge-Philco C-1608.** Push-button tuning goes haywire, so that 550 to 650 stations won't come in; due to defective .00028 series paper condenser. Replace with bakelite condenser. Also, replace .0005 padder with same type condenser to avoid further trouble. This could apply to all such push-button tuning where padder and parallel condensers are of paper and wax construction.—D. V. Chambers, Phila., Pa.

* * *

**Emerson Chassis K.** When you encounter a noisy composite oscillator and first i-f transformer in this model and can't wait to order a new one, I suggest replacing with a standard 456 Kc i-f unit. Cut off the oscillator section of the winding on the old coil and mount it under the chassis. This circuit is rewired exactly the same, and works fine.—M. D. Brown, Athens, Georgia.

* * *

**Fada Model 5F60.** The tone quality of this set can be greatly improved by adding a condenser of from 5 to 25 mfd. across the bias resistor in the cathode circuit of the 25L6GT output tube.—M. D. Brown, Athens, Georgia.

* * *

**Faulty AVC Action.** The quickest way I have found for checking faulty a-v-c action and intermittent trouble has been to cut all by-passes loose from the chassis and then with the set in operation connect the ground lead of my VTVM to chassis and with the probe, check each condenser's leakage on the low range of the meter. I have found that an indication as small as .05 volt leakage is sufficient for replacement. For replacement I use a popular line of 600 volt tubulars and as a precaution check each for leakage value at approximately 600 volts, reducing the range of the VTVM to the lowest range after the initial charging surge has occurred and using only such capacitors as show no leakage. Incidentally I have not sent any back for replacement so far.—Paul V. Zeyn, Milton, Pa.

* * *

**General Electric HJ618 AC.** Have had several of these sets with the complaint of being weak and off calibration. Set would not align properly and on checking over the chassis with the service sheets I found a .004 mica condenser connected from junction of C3 padder condenser and C16 a 47 Mmf. condenser to ground. This condenser is not shown on the service sheets and when it was removed the set aligned perfectly and the owners remarked that they played better than when new.—BCL Radio Sales & Service, Detroit, Michigan.

**Gilfillan.** Some of these sets have a welded dial assembly, making dial belt replacement impossible unless the following instructions are followed

First, with a sharp pen knife, loosen the cork ring which holds the dial face in place taking care not to damage the ring. Next, remove the dial hand carefully and dial face can be easily removed. Then loosen the three screws behind the dial face and the two screws holding the pilot light terminals; replace the dial belt and re-assemble the dial lamp carrier, re-cement cork ring, taking care to replace in same position as the original to keep calibration correct. Place dial hand back in position.—W. H. Updegrove, Carterville, Mo.

* * *

**Howard 518 Series.** If customer complains of too much bass, cut the .002 condenser connected from grid of 6F6GT bass booster to ground. Leave in circuit for re-connection later, if more bass is desired. At the same time, replace the condenser connected from the low side of the i-f plate de-coupling resistor (1000 ohms) to cathode, with an .05 – 600 volt unit. It is also wise to install a new 0.1 600 volt screen by-pass. The hum level is very low, but last traces can be removed by adding an 8 mfd. 450 volt across the input filter.—G. B. Swalwell, Niagara Falls, N.Y.

* * *

**Index Pages.** When a new index page for the Technical Section comes along, I have been placing it directly after the last issue covered by it, then attaching an index tab to the edge near the upper corner as a marker for locating it quickly. This permits quick examination of the previous issues' contents for any information desired and if not located there, it is easier to look through the later copies from that point on for the desired information. Incidentally, a piece of scotch tape folded and attached to the sheet makes a neat tab for the use of the above idea.—Paul V. Zeyn, Milton, Pa.

* * *

**Master Shop Switch.** To insure against damage to equipment connected on the electric service line in the shop, install a master switch which will disconnect all instruments, soldering iron, lights, etc. A simple flip of the switch when going home for the night, or when leaving the shop for any length of time assures you that everything is off. This master safety switch will supplant a half dozen or more switches that many servicemen use.—Radio Service, Richmond, Virginia.

* * *

**Motorola Model 59T5.** In this receiver, raspy and distorted reception can be caused by a leaky coupling condenser (.03 mfd.) between the 75 plate and the 41 grid. This condenser is rated at 400 volts d-c working voltage. The voltage in this particular circuit runs as high as 450 during the "warm-up" period and it is advisable to replace with a 600 volt condenser.—W. H. Updegrove, Carterville, Mo.

* * *

**Oldsmobile 982006.** Complaints of intermittent volume and squeals can be overcome by soldering a flexible bond from ground connection of volume control to chassis. The grounded end of the volume control is regularly connected to the case of same and when the set is subjected to a jar it is intermittent.—M. D. Brown, Athens, Georgia.

* * *

**0Z4 Replacement.** Often trouble is experienced with failure of the 0Z4 gas filled rectifier tube. This tube seems rather fragile and often fails at the first high surge. My answer to this problem has been solved by substituting a 6X5GT tube. Many sets are wired with the filament voltage so this tube can be inserted in the 0Z4 socket, but if not, voltage can easily be added. When an 0Z4 metal tube is used, simply use a shield on the 6X5GT.—Clarence E. Hall, Yukon, Pa.

* * *

**RCA Victor Models V205, VHR207, VHR407.** A frying or sputtering noise in the output, which continues even when the volume control is turned down to a minimum, is often due to the 6F6G output tubes. This trouble is due to a slight heater to cathode leakage even though the tubes test OK on a tube tester. I have changed tubes in quite a few of these sets after they had been in operation for some time.—Harry Hudson, Detroit, Michigan.

* * *

**RCA Iron-Core I. F.'s.** Oscillation in RCA receivers which use iron-core i.f.'s (All RCA from about 1937 up) will almost always result when a new i-f tube is installed. This is especially true of the newer receivers using the new single-ended tubes. Motorboating may be present. The cure for this trouble is complete i.f. realignment. Can be detuned, but a loss of sensitivity occurs. The sure way to align a job like this is to start with the last stage and work towards the first. The important thing to remember is to not touch the tuning of any of the stages once they have been tuned. Do not, for instance, tune the 3rd i-f, go to the 2nd, and then back to the 3rd again. This is critical and very important.—Radio Service, Richmond, Virginia.

* * *

**Repairing Noisy Volume Controls.** To repair noisy volume or tone controls, of the carbon type, unsolder control from set, submerge complete control in carbon tetrachloride and rotate back and forth several times. Install in set and it will work as good as new.—Oliver F. Klein, Milwaukee, Wisconsin.

* * *

**Rider Chanalyst.** When the audio or a-f eye closes while the cable is not inserted in the jack for that circuit, replace condenser C-10 with a new 10 mfd. 25 volt or 35 volt electrolytic condenser. This capacitor as used in the power section filters the ripple voltage appearing across inductance L1 in the negative return of the power transformer and also in the grid circuit of the triode section of the 6Q7 through R-45. It is important that C-10 be in good order at all times.—Paul V. Zeyn, Milton, Pa.

* * *

**Tubes in Series.** When replacing a burned out tube in an ac-dc set, check the voltage drop across each filament. The filament resistance seems to change with time and while it is not critical insofar as 6 volt tubes are concerned, it will be found with 12, 25, 35 and 50 volt tubes. With proper explanation to one's customer one can always sell tubes in addition to the burned out ones. After all, why guarantee the replacement without replacing those tubes that will cause future burn-outs.—Homer C. Buck, Detroit, Michigan.

* * *

**Zenith 5810, 5811 & 5719 Chassis.** Set was very weak with voltages far below normal. This condition is very often due to decrease in capacity of electrolytic condenser C19 which is a 30 mfd. 250 volt unit. Hum level is still very low even if the capacity of this condenser is low, but as this set uses a voltage doubler circuit, the current handling ability of this circuit is limited by this condenser. Use only a 30 mfd. 250 volt unit for replacement.—B C L Radio Sales & Service, Detroit, Michigan.

# THE MYSTERY OF THE 35Z5 OPEN FILAMENT

By W. R. Jones

Sam Service Man has been going around for some time now with mighty short finger nails and it really bothers him to no end, because those nails came in pretty handy to strip the insulation from wires when he left his wire strippers at home, but poor Sam has been scratching his head so often over those "doggone" open filaments that his nails just have no chance at all. Not that Sam's head is extra hard, mind you, but those open filament problems have been so varied that as soon as Sam thought he had one licked, up "popped" another.

Sam says Mrs. So-and-So is having trouble with the pilot light popping out in her radio, and if he didn't get there pronto to replace it the 35Z5 "popped" too; and in Mr. Whatsits AC-DC set there was trouble with the various tubes in the string which turned out to be an open filament; and he had to replace a lot of 1N5's in AC-DC battery portables.

Let's see if we can't throw a little light on Sam's filament difficulties, one at a time.

Figure 1 shows the circuit employed in using 35Z5's and 45Z5's in typical receivers. The 35Z5 and 45Z5 are similar to other half-wave, close-spaced, rectifier tubes with the exception that the heater has a tap brought out for a pilot lamp at a point which is 7.5 volts from one end of the heater when rated heater voltage is applied and only heater current flows. Therefore, a pilot lamp can be placed across this tapped section which eliminates the necessity of a ballast resistor as is required to secure the pilot lamp voltage when using other type rectifiers.

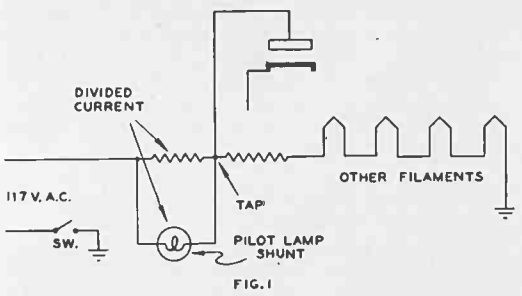


FIG. 1

However, in order to increase the brilliancy of the pilot lamp it is current design practice to connect the rectifier plate also to the heater tap so that the total plate current of the receiver will pass through the pilot lamp. This is why panel lamps flicker on strong signals—because the plate current varies with the signal strength and naturally the amount of plate current passing through the pilot lamp will also vary.

Sam has often noticed that the pilot lamp in these receivers lit like a lighthouse when first turned on. This was due to the fact that when the tube filaments were cold, as they would be when first turned on, the current drawn by the series string filaments would be very high as the resistance of the filaments was low; but when the filaments become hot their resistance increases and the current is reduced, and as the pilot lamp is shunted across a section of the filament there is a large voltage drop across the pilot lamp, caused by the high current of the cold tubes, and it is this high voltage drop that can damage the pilot lamp and cause it to open. As soon as the tubes are warm this voltage decreases and the pilot lamp hardly lights until plate current starts to flow then the light comes up to normal brilliancy.

Now look at Figure 2 and see what would happen if that damaged pilot lamp was not replaced.

Remember that the pilot lamp acts as a shunt across a section of the rectifier filament and keep in mind that the total plate current of the receiver also passes through this shunted section.

Therefore it can be seen from Figure 2 that with a missing or burned-out pilot lamp the tapped section of the rectifier filament must complete the circuit for the plate current, carrying, in this way both the rectifier and filament currents.

The filament is designed to carry 150 ma. but the plate current is now added to this and as it is normally around 50 ma. we have a total of 200 ma. passing through the tapped section, thus subjecting the tube to a considerable power overload which will shorten its life. In other words, there is approximately 15 volts across a section that is designed to have only 7.5 volts. Now should the receiver be turned off and on without allowing the tubes to cool, another problem presents itself which generally causes the filament of the tapped section to burn out. This problem is called "On and Off Cycling" and depends a great deal upon the capacity of the input filter condenser.

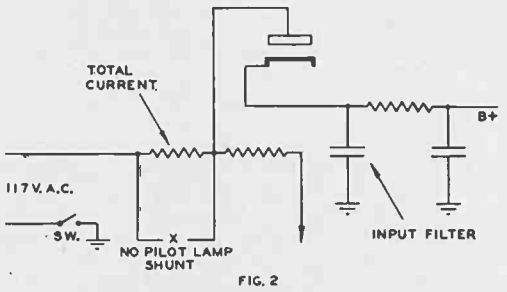


FIG. 2

"On and Off Cycling" can be illustrated by the following example Mrs. Smith had not replaced the pilot lamp in her receiver and one evening she thought she heard the telephone ringing, so she turned off her radio for an instant to make sure. The telephone was quiet so she turned on the set again—the set failed to work.

The set did not work because when Mrs. Smith switched off the current the cathodes of the tubes were hot and had consumed all the voltage that was stored in the filter condensers. Then the next instant the current was turned on again and the rectifier cathode still being hot allowed current to flow to the filter condensers to become charged again. The current consumed in charging the input filter condenser is very high and the larger the capacity the higher it is. This current is plate current and must pass through the tapped section of the rectifier filament, thereby adding to the filament current and causing it to be high enough to burn out the filament. It often happens that this same charging current is high enough to exceed the peak plate current limit of the rectifier, thereby causing the cathode tab to melt. The melted cathode in turn may short to the filament or plate causing A-C voltage to be applied across the filter condenser which will certainly cause it to break down.

To help prevent this difficulty, look at Figure 3.

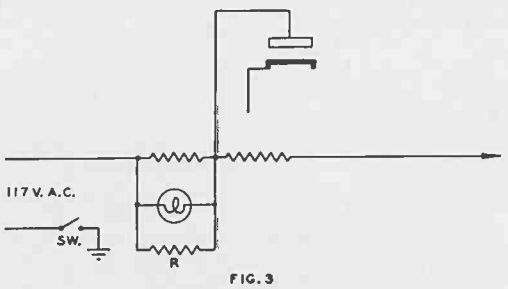


FIG. 3

All that is needed is the resistor "R" shunted across the pilot lamp. This resistor not only prevents the high voltage surge from damaging the pilot lamp when the receiver is first turned on but will protect the tapped section should the lamp be removed. Furthermore, it will help protect the tube from the high charging current drawn by the input filter condenser.

The value of resistor "R" is 300 ohms when a #40 or #47 pilot lamp is used. Should the receiver not use any pilot lamp then a resistor of 800 ohms must be shunted across the tapped section.

## Technical Manual Supplement, Free

In order to bring the Sylvania Technical Manual completely up-to-date a supplementary sheet is now available.

The Sylvania tubes listed in this supplement are those types announced since the Fifth Edition, Second Printing of the Sylvania Technical Manual was released. It is to be used with the Technical Manual and is arranged so that it will fit on the inside back cover. Wherever possible a cross reference has been made so that the large number of tube types is shown in a minimum of space. Base views and characteristics are referred to equivalents, and where impossible to do this, base views and operating characteristics are given. To order, use coupon on Page 3, Main Section. If you do not have a Fifth Edition, Second Printing of the Manual or your present Manual is worn, a new one with the supplement added can also be ordered on the coupon.

## Signal Interceptor

**Signal Interceptor.** The signal interceptor by P. M. Ohlinger, shown in Sylvania News, Volume 9, No. 2, is a clever gadget. Filament supply for this may be obtained from the set operated, if the constructor will provide these leads with a bayonet connector (female) such as is used for antenna connections on auto radios. Solder one lead to the center contact and the other to the shell. Then make up two assemblies comprising one male type section of the above mentioned connector assembly and a miniature bayonet and screw type bases from defective pilot lights wired close together. This permits the screw type to be inserted in place of that type of lamp on the dial assembly of the set, the handiest point at which to tap the heater circuit. By careful work the two types of bases may be assembled to one male type connector also, but extreme caution must be taken to avoid possible shorts. This will eliminate the need for carrying four flashlight cells along with you.—Paul V. Zeyn, Milton, Pa.

* * *

**Signal Interceptor.** Here is a variation in the signal intercepter by Mr. Ohlinger, published in Sylvania News. For those who wish to use a-c instead of the batteries as in the original, I suggest the double-diode type 117Z6GT, hooked up the same as the original 6H6, but with 110 volts applied to the heater. A condenser on each side of the line should be used, .01 mfd. is satisfactory. A switch in one side of the line is convenient. There is another addition which makes use of a small variable condenser, or padder, and a 600 Kc oscillator coil in the event that you have a low frequency station near you. In case there is none, it is necessary to wind a coil tuned to the station near you. This coil with the tuning condenser across it, is placed across the original antenna and ground connections. In Mr. Ohlinger's model I was unable to get a signal through the i-f, but with this change you can get a nice signal through from the r-f to the a-f. Put the prod to the grid of the second detector and use the phones as a microphone. Put an alarm clock flat against the phones and you can then tell if the a-f is clear and free from distortion. This alarm clock can be used very successfully where you have to test call systems and you are alone when you are doing the work. I have found that this is a good signal to use for any test that uses a-f. The signal is clear, the frequency is good and it is a "robot."—R. de Q. Sullivan, Miami, Florida.

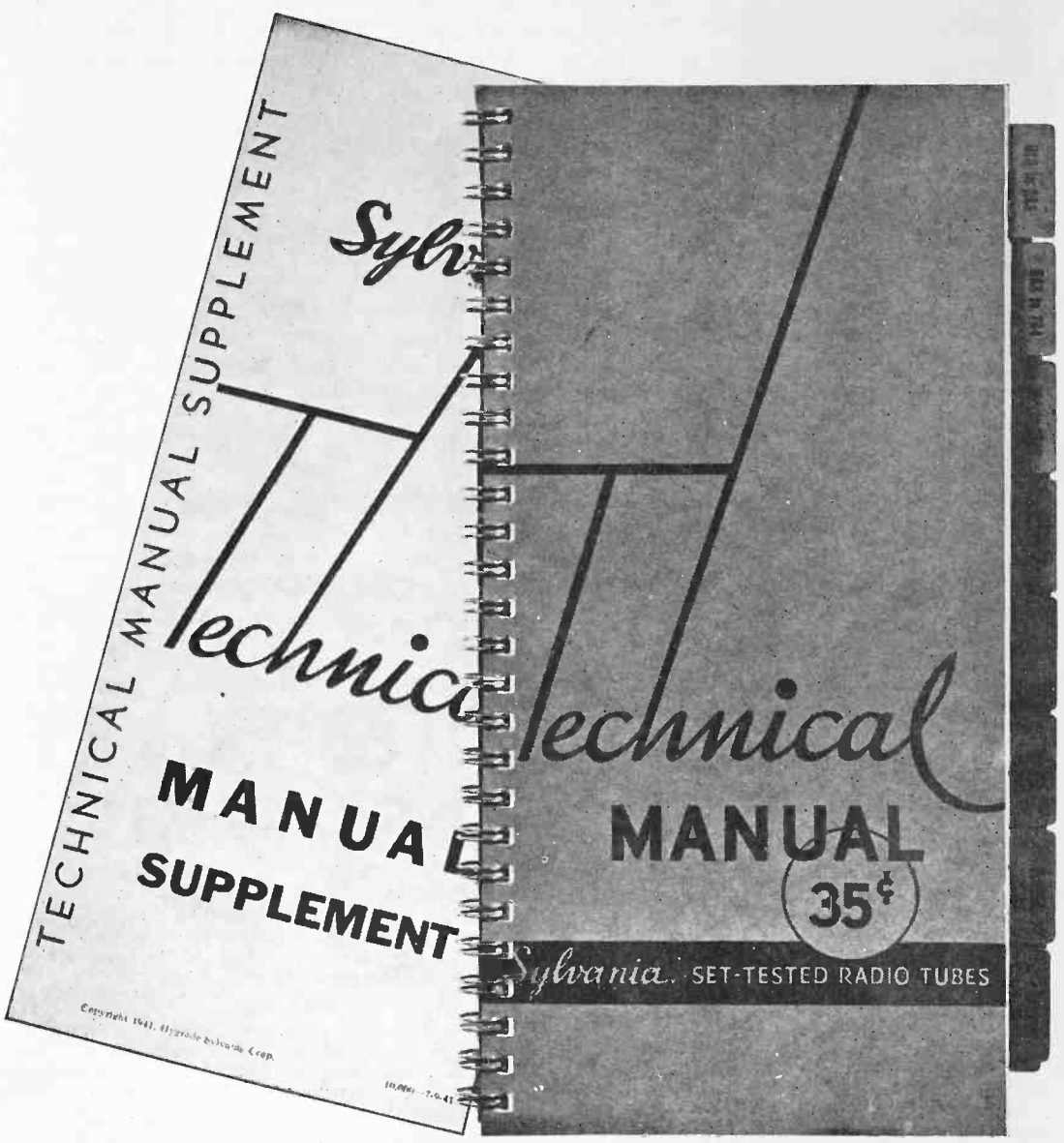
# SYLVANIA NEWS

## TECHNICAL SECTION




JULY-AUGUST, 1941 EMPORIUM, PENNA. Vol. 9, No. 4

# TUBE DATA UP-TO-DATE



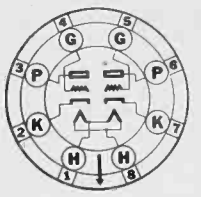

**Owners of the latest edition of the Sylvania Technical Manual can bring Sylvania Tube characterisitics up to date by adding the free Supplement shown above. The tubes listed are those that have been announced to the trade since the latest printing of the Manual.**

**Wherever possible cross references have been made so that the large number of tube types is shown in a minimum of space. Base views and characteristics are referred to equivalent types, and where this is impossible, base views and operating characteristics are given.**

**The Supplement is arranged so that it will fit inside the back cover of the Manual.**

**Servicemen ordering copies of the Sylvania Technical Manual, price 35c, will also receive the Supplement. Both Manual and free Supplement may be obtained from your Sylvania Jobber.**

## Sylvania Type 14N7 Duotriode Amplifier




8-AC

Sylvania Type 14N7 is a duotriode of "Lock-In" construction, designed especially for use as a phase inverter or as a voltage amplifier. Except for heater ratings, Type 14N7 is electrically equivalent to Type 7N7. The plate, grid and cathode of each triode section are brought out separately thus permitting adaptations to special designs. The voltage between heater and cathode should be kept as low as possible if direct connection is not made.

For phase inverter service the effective plate voltage is the supply voltage minus the voltage drop in the plate resistor. The self-biasing resistor will not require a by-pass condenser when the 14N7 is utilized for phase inversion. The values given for voltage amplification are the voltages as measured from plate to plate for a signal of one volt applied to the grid of the input section. The maximum output voltage is also given for the entire tube, measured from plate to plate when the maximum peak signal is applied to the input grid.

The value of grid return resistance of the succeeding audio amplifier should be governed by the type of tube employed in that stage, but should never be less than twice the plate resistance of the 14N7 in order to avoid serious distortion.

Because of its dual features this tube tends to have a higher operating temperature than most tubes with the same bulb size. For this reason it is recommended that it be located in a well ventilated position. Where excessive heating is encountered due to insufficient ventilation special attention must be given to the grid bias and grid resistor values employed to restrict the possibilities of grid emission.

### CHARACTERISTICS

| | | |
|---|---|---|
| Heater Voltage (Nominal) AC or DC | 14.0 | Volts |
| Heater Current (Nominal) | 0.320 | Ampere |
| Bulb | | T9-G |
| Base—"Lock-In" 8-Pin | | 8-AC |
| Mounting Position | | Any |

Direct Interelectrode Capacitances:*

| | Triode (1) | Triode (2) |
|---|---|---|
| Grid to Plate | 3.0 | 3.0 μμf |
| Grid to (F+K+Shield) | 3.4 | 2.9 μμf |
| Plate to (F+K+Shield) | 2.0 | 2.4 μμf |
| Plate (1) to Plate (2) | 0.34 | μμf |
| Grid (1) to Grid (2) | 0.4 | μμf |
| Grid (1) to Plate (2) | 0.08 | μμf |
| Grid (2) to Plate (1) | 0.06 | μμf |

*With Standard RMA Tube Shield connected to Cathode

### Operating Conditions and Characteristics:

| | Class A Amplifier | |
|---|---|---|
| Heater Voltage | 12.6 | 12.6 Volts |
| Heater Current | 0.3 | 0.3 Ampere |
| Plate Voltage | 90 | 250 Volts |
| Grid Voltage | 0 | −8.0 Volts |
| Plate Current | 10.0 | 9.0 Ma. |
| Plate Resistance | 6,700 | 7,700 Ohms |
| Mutual Conductance | 3,000 | 2,600 μmhos |
| Amplification Factor | 20 | 20 |
| **Typical Operation as Phase Inverter** | | |
| Plate Supply Voltage | 100 | 250 Volts |
| Grid Voltage | −2.25 | −5.5 Volts |
| Plate Current per Section | 1.5 | 2.4 Ma. |
| Plate Load Resistor per Plate | 30,000 | 50,000 Ohms |
| Self-Biasing Resistor | 750 | 1,150 Ohms |
| Voltage Amplification (Approx.) | 26 | 29 Volts |
| Maximum Output Voltage-RMS (Approx.) | 20 | 65 Volts |

## DISCONTINUED TYPES

Within the past few weeks, Eight Sylvania tube types have been discontinued. These types have been withdrawn from regular factory stocks; however, your Sylvania Jobber may still have a few of them in his stock. The discontinued types are as follow:

**Type 1D8GT**—This type has been discontinued and no available type can be used as a replacement tube.

**Type 3LE4**—This "Lock-In" tube has been withdrawn and there is no direct interchangeable type.

**Type 5T4**—Has been discontinued, but the Sylvania 5U4G can generally be used as a replacement tube. No changes are necessary in socket wiring. The 5U4G should not be used if the power transformer will not stand 1.0 ampere additional filament current.

**Type 6B6G**—This tube, which is essentially the same as a 6Q7G, has been withdrawn and the Sylvania 6Q7G can be used as a direct replacement. No changes in the circuit are necessary and the performance of the receiver will be satisfactory by substituting the 6Q7G.

**Type 6W5G**—This discontinued type can be replaced with the 6X5GT/G, where the receiver's current drain is not greater than 70 milliamperes. When using the 6X5GT/G in receivers having a drain greater than 70 milliamperes, damage to the tube may result which will be considered as "Electrical Abuse" in our adjustment policy.

**Type 25D8GT**—Has been withdrawn and has no similar type that can be used for replacement.

**Type 70A7GT**—Is discontinued. No available type can be used as a replacement tube.

**Type 1620**—This non-microphonic metal tube has been withdrawn and cannot be replaced 100% by any available type, however, Sylvania type 1223, a "G" style tube, may be used in some cases. Base pin connections, electrical characteristics and non-microphonic characteristics of type 1223 are the same as those for the type 1620. Therefore, where size and metal shielding are not a factor, type 1223 should prove satisfactory as a replacement tube.

## A CHAT WITH ROGER WISE

**Chief Tube Engineer**
**Hygrade Sylvania Corporation**

A number of strategic metals are required in radio tube production, and in some cases substitutes are necessary in place of those which are becoming scarce due to the requirements of the National Defense Program. We have received inquiries from our customers as to the effect on tube characteristics and tube life of such substitutions as have already been made, or are contemplated.

In line with our policy of building a quality product we are maintaining the same test requirements, both as regards characteristic tests and life tests, that have been proved in the past to be sound and satisfactory. We are confident that the following out of this policy will mean that as far as radio set use is concerned, no change in performance, initially or during life, will be noted as tubes carrying the substitute materials are put into service.

Shortages of aluminum and zinc had very little effect on radio tube production because the quantity of these metals previously used was small. At least in the case of zinc, most of that used appeared in such items as pins, top caps and base shells, where use of a substitute material could hardly affect the operation of the tube in any way. For a number of years the tendency to use steel for certain parts has been increasing, and in connection with the use of that material our program has involved a very large amount of experimental work in determining the best grade of material and the processing necessary to secure best results. With the shortage of nickel becoming more acute, it has been possible to use a larger amount of steel in the tube parts carrying most of the weight of metal in the tube. Since the information on the use of this material has been obtained through adequate experimental work, it has not been necessary to drop our test standards as the quantity of this material used has been increased.

We cannot, of course, predict just what changes will be necessary from time to time, as we continue to comply with the demands imposed on us through cooperation in the National Defense Program. We do not believe, however, that we will be placed in such position that it will be necessary to make substitutions which result in the production of tubes which do not have normal life expectancy or show impaired operation in well-designed radio receiver circuits.

# FLUORESCENT LAMP RADIO INTERFERENCE

### COMMERCIAL ENGINEERING DEPARTMENT, HYGRADE LAMP DIVISION

Experience in the application of fluorescent lamps has shown that they may give rise to radio interference under certain conditions. While the number of instances in which this has occurred is relatively small, in comparison with the total number of installations in operation, it can prove very annoying when it does occur and this has led to considerable study of its cause and elimination.

Since the radio serviceman has established himself as an authority on all problems dealing with radio operation, the public, naturally, has turned to him for a solution of this difficulty and, as a result, radio men are anxious to learn as much as they can about the subject in order to be able to render this service to their customers. In order to supply readers of Sylvania News with the latest information on this subject, we have asked the Lamp Division of the Hygrade Sylvania Corporation to prepare a summary of their experiences with radio interference from fluorescent lamps.

The Lamp Division informs us that radio interference from fluorescent lamps arises from the fact that the arc within the lamp must be reestablished each time the voltage wave of the alternating current supply passes through zero; i. e., 120 times per second on a 60 cycle supply. Each time this arc is established it results in the generation of energy in a form which, under certain conditions, may give rise to radio interference.

Experience has indicated that if the lamps are properly installed and used with high quality auxiliary equipment, only a small percentage will cause objectionable radio noise. By proper installation is meant that the auxiliary equipment should be enclosed in steel channel; the wiring should be made up with tight connections; the lamps and starters should be firmly installed in the sockets; and the fixture should preferably be grounded. It has been found that grounding the fixture to gas pipes, metal lath or metal ceilings often times increases the interference. In many instances where radio interference is encountered it will be found that these precautions have not been observed and that the interference could be greatly reduced or eliminated by the use of properly installed equipment.

Standard fluorescent lamp starters include a small condenser connected across the starter terminals, as an aid in the elimination of radio interference, Fig. 1. During normal lamp operation this condenser is in parallel with the lamp and aids materially in the prevention of radio noise.

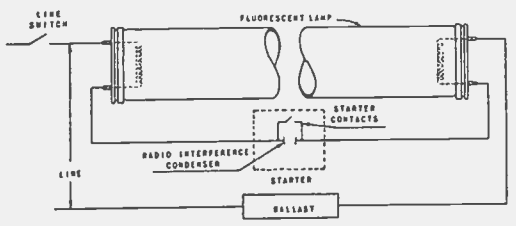



**Fig. 1**

In checking an installation which is causing radio interference, in order to locate and eliminate the cause, it is suggested that an effort first of all be made to determine just which unit or units are causing the trouble. In some instances it will be found that most, or all of the interference is coming from a single lamp or lighting unit. This can be determined by turning on the units one at a time until the offending unit is located. If the trouble can be isolated to one or two units in this way, the next thing to check is the condenser in the starters.

Perhaps the easiest way to do this is to replace the starter with a new one, and if this does not change the noise level to any extent then it may be assumed that the condenser in the original starter was operating satisfactorily. Another way is to remove the starter while the lamp is in operation, and if this causes the noise level to increase it demonstrates that the condenser in the starter was operating satisfactorily, and it therefore will be necessary to look elsewhere for the cause of the radio noise.

If the lighting fixture is one in which the starter is mounted under the lamp in such a way that it is impossible to remove the starter without removing the lamp, the following procedure may be followed: With the starter removed and the lamp in place, the two contacts in the starter socket should be short circuited with a short piece of insulated wire which has been stripped for about one-quarter inch at each end. This short circuit should be maintained until there is a definite glow at each end of the lamp, and the lamp should light when the wire is removed.

It will be found helpful to keep in mind that the interference may be reaching the radio in three possible ways, and that in any particular instance the noise may be due to any one of these or to a combination of any two, or all of them.

(Continued on page 4)

# The SERVICE EXCHANGE

THE information presented in the Sylvania Service Exchange is contributed by service men as the result of practical experience. It is very carefully considered before being accepted, and we believe it to be correct and authentic. However, we assume no responsibility with respect to results. Each hint accepted entitles the writer to his choice of one Sylvania receiving tube. Please indicate preference when submitting hints. Don't send routine or generally known information. Please specify tube choice.

**Dial Belts.** A permanent cure for slipping dial belts is most welcome and still very simple. Before installing a belt, rub plenty of bees wax over it. Heat over a flame, thus melting the wax which will impregnate the fiber. Be careful not to burn the belt. It can now be installed and your worries of belt slipping are over.—James Limbeck, Glendale, Calif.

* * *

**Grunow Model 7B.** When this set plays on shortwave, but is inoperative on broadcast, check for a defective .01 condenser on six section band change switch. This condenser is hard to see, being located deep in the chassis under the fourth and fifth sections (counting from front of set) of the band change switch.—T. Henshaw, Marysville, Kans.

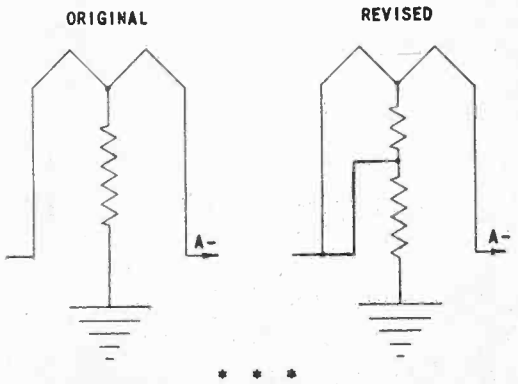
* * *

**35Z5GT & 45Z5GT Replacements.** Inserting the 35Z5GT or 45Z5GT rectifier tubes in chassis with power switch on is bad practice.

Frequently, by so doing the pilot lamp will flash and burn, because all contacts from tube to rectifier socket are not made simultaneously and the filament tap shunt across the pilot light is open, causing large surge current through the pilot light.—Harold Vernon, New York, N. Y.

* * *

**Motorola Model 3A5 Circuit Revision.** Should you experience any tube burn-outs in Model 3A5, it is recommended that you change resistor values as indicated in the sketch below. The change is made in the type 3S4 circuit. The 1700 ohm resistor is removed and two resistors are added, as follows: One 390 ohms, ⅛ watt-10%, and one 680 ohms, ⅛ watt-10%. Please note the connection that is made to the mid-point of the two resistors.




* * *

**Oldsmobile Model 982045.** If it is found that this set oscillates on the low and high frequency end of the dial when it is properly aligned, lower the value of the oscillator grid leak shunted across the low frequency oscillator padder. Reduce this resistor to 20,000 ohms. I have found that if the grid leak is more than 20,000 ohms the set will oscillate. Lower the resistance and you will find that oscillation stops and the set can be easily aligned.—Warren F. Steely, Reading, Penna.

* * *

**Philco Sets in '37 Fords.** The common complaint is an annoying noise when tuning from station to station. We have remedied three cases in the past week by simply grounding the rotor of the tuning condenser with a short piece of dial cable. Although this complaint may be made on any set whether home or car set, we believe you will find current trouble with the above mentioned sets.—Bernard Greene, Petersburg, Va.

**Philco Models 38-22, 38-23.** To prevent hum when the volume control is on full, the red and brown leads from the second i-f transformer must be placed as far as possible away from the cable and pilot lamp leads at the rear of the chassis.—Robert Ellias, Jacksonville, Fla.

* * *

**Philco Model 59.** With no signal and no oscillator grid voltage, check the antenna primary winding for an open. Check the 1400 mmf. mica condenser across 6M oscillator cathode resistor for dead short. You may think that can't happen as it did, but it can as I found out after three hours of labor.—J. Darr, Mena, Arkansas.

* * *

**Philco Model 84.** Bad reception and loud hum with tubes and voltages may be caused by a loose rivet that holds the 42 socket lug from the 42 cathode grounding. This rivet often will make poor ground connections if loose. Tighten it by using a small nut and bolt and the set will be OK again.—Geo. Baer, Roslindale, Mass.

* * *

**Philco Model 630.** Set screeches for a few seconds, then goes dead. Turning set on and off brings back reception. Look for tone control condenser that breaks down intermittently. Earle W. Meredith, Rochester, N. Y.

* * *

**RCA Models 9TX31, 9TX32, 9TX33.** When the pilot bulb burns out in these sets, the 24 ohm pilot shunt resistor will soon burn out, opening up the filament circuit. I have used 25 ohm, 10 watt resistors for replacement with no comeback. The pilot bulb may not be marked—it is #47.—Harold Goff, Syracuse, New York

* * *

**RCA Model 45X11.** Severe distortion, stations peak at two places. No. A.V.C. Cause: Points No. 5 and No. 3, on loop connections tied together which grounded grids of 12S7 and 12SK7 tubes. Refer to diagram. To remedy. cut wire across these two points and realign the set.—William O. Moore, Houston, Texas.

* * *

**RCA Victor Models 96E, 96T, 96T1.** Motorboating is often caused by an open second filter condenser or an open 0.1 mfd. condenser from the bottom of the antenna coil secondary to ground.—Geo, Radio Service, Elizabeth, N. J.

* * *

**RCA Victor Model 280.** Lack of volume in this set may be due to an open in the reactor coil (L-16) of 3,200 ohms. One end of this coil is connected inconspicuously to the volume control. The leads from the coil are very fine and should be checked.—Geo. Baer, Roslindale, Mass.

* * *

**Sonora Model A-11.** In this small four tube AC-DC radio a loud hum will often develop. The filter condenser is of the plug-in type. It is equipped with an octal base just like a tube. The prongs of the socket lose tension and the filter action is intermittent. Either bend the prongs or solder for a permanent protection. Marion L. Rhodes, Knightstown, Indiana.

* * *

**Stewart-Warner Model 6C9.** When the motor on this automatic record changer fails to turn, it is caused by corroded a-c connections on the inside of the motor. This comes apart very easily and all that is necessary is resoldering of the connections. It is not necessary to dismantle the entire unit for this repair as there are only two screws holding the motor in place and it comes out easily when they are removed. Robert Schmetter, Bronx, New York.

**Stewart Warner Models 12-4D1, 02-4C1, 02-5T1, 02-428, 205CA & 205CK.** Each of the above models utilizes an on-off indicator located in the dial face. The on-off indicator is operated mechanically by an arm attached to the volume control shaft. Since this arrangement is of necessity a friction drive, you may encounter isolated cases where a small burr or rough surface will make the volume control knob exceedingly hard to turn. This action is noted particularly when an attempt is made to turn the set off.

The remedy for the above condition is to first examine the arm and slider (arm attached to volume control shaft and slider located under dial scale) to determine if these parts are smooth and free of burrs. Any burrs or roughness can be corrected by filing. Then place a small amount of grease or vaseline on the portions of both parts which make a sliding contact. This lubricant will make the parts operate much easier. During production, special care is taken to see that these parts are smooth and well lubricated.—Stewart-Warner Corporation, Service Department.

* * *

## TIRE, WHEEL AND BRAKE STATIC

**Tire Static:** From present indications, you will probably have plenty of trouble with tire static this summer. Reports now coming in reveal that certain changes which have been made in tire construction, make the condition worse than ever before. Some makes of tires are considerably worse offenders than others.

Unfortunately, there is no sure-fire cure for tire static. It is definitely not the fault of the radio, for any make of good sensitive receiver will pick up the interference if the tires are creating it through friction with the pavement.

Tire static can be heard as a steady "whine" or sometimes as a "thump" that occurs with each revolution of the wheel. It seldom occurs below 20 miles an hour, and in some cases the speed must be greater before it becomes bothersome. If you have any doubt about the interference being tire static, drive over a stretch of pavement where the interference is present; then wet the tires with a hose or a bucket of water and drive back over the same stretch. No static will be created while the tires are wet, but it will gradually come back as they dry out.

Sometimes, a conducting paint applied to the sidewalls and bead of the tire will afford remporary relief. The noise will be back, however, when the paint wears off. Such a paint may be mixed with naphtha, powdered graphite and a little rubber cement. Do not apply to the inside of the tire or to the tube. In the case of white sidewalls, paint one sidewall only, the one that faces inside.

The most satisfactory answer to the tire static problem, is to use a type of aerial that mounts on top of the car, and to shield the lead-in carefully. In that location, the aerial is away from the immediate "field" of the static, and picks up considerably less interference than an aerial on the side cowl or fender.

**Wheel Static:** This type of interference resembles atmospheric static, and usually occurs at speeds above 20 MPH. Front wheel static collector springs, Part No. M-6, will usually eliminate this type of interference.

**Brake Static:** Static discharges occurring at regular intervals, and increasing with the speed of the car, is usually caused by the brake dragging or by high spots on the brakes. Adjusting the brakes, or realigning, will usually eliminate this source of interference.—Motorola Service Bulletin.

# FLUORESCENT LAMP RADIO INTERFERENCE

(Continued from page 2)

These three ways, as illustrated in Figure 2, are:

1. Radiation direct from lamp bulb to the radio antenna system.
2. Radiation from the power lines supplying the fluorescent units to the radio antenna system.
3. Feed back from the fluorescent unit through the electrical power lines to the radio.

These three types of interference and their elimination will be considered in the order listed above.

**1. Direct Radiation.**

It has been found that the distance over which the direct radiations from the lamp are effective in producing interference is usually less than 10 feet, and therefore this type of interference can be eliminated if it is possible to move the radio and its aerial system outside the effective range. Of course, if there is a metal ceiling or extended metal work, such as pipes or beams located near the lamp, the direct radiations may appear to travel at greater distances than otherwise, and the distance at which the radio must be located will be correspondingly greater.

In checking an installation to determine if direct radiation is the cause, it is frequently possible to move the set and its aerial until it is at a distance of ten feet or more from the suspected lamp. A portable battery set is frequently helpful in making an exploration of this kind, since there is no possibility of line feed back and any interference which is encountered from the lamps will be due either to direct radiation from the lamps or from the lines, as discussed below.

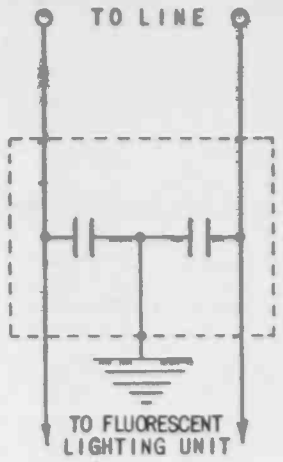



Fig. 3

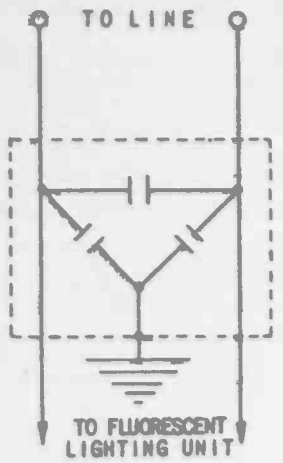



Fig. 4

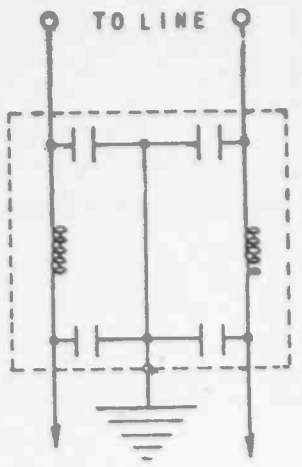



Fig. 5

If it is found that direct radiation is the cause, but it is necessary that the radio itself be within the range of the radiations, it may be possible to eliminate the interference if the aerial is kept well outside the interference range and is connected to the radio by a shielded lead-in wire with the shield grounded. The radio should also be provided with a good ground connection.

In the AC-DC type sets the chassis usually is grounded to one side of the line, and for that reason an external ground connection is not required. There are also some small AC-DC receivers which employ one side of the line as antenna as well as being grounded to the other side. In such cases it is a simple matter to disconnect this line-antenna connection and substitute a length of standard indoor antenna wire. It is also helpful to connect a .05 mfd. condenser across the line. Not only does this greatly reduce feed back through the line from fluorescent installation but is necessary in many cases to avoid feeding back when there is another radio on the same line.

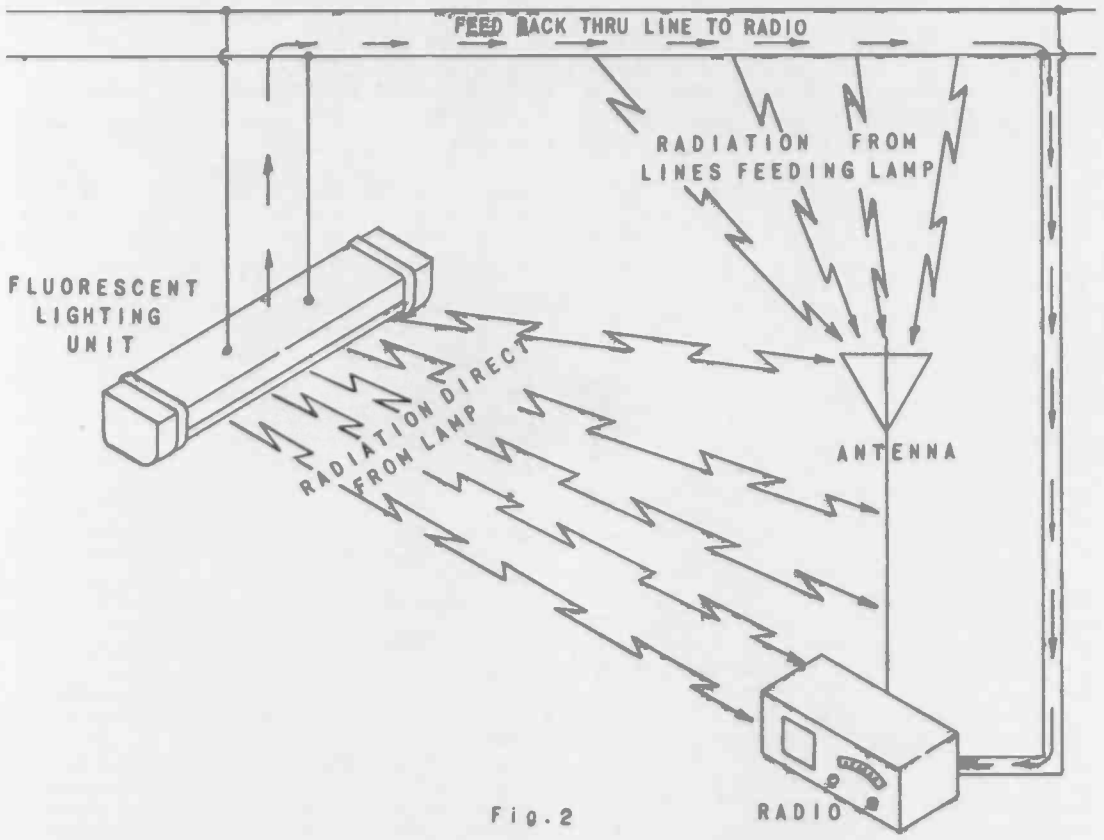



Fig. 2

**2. Line Radiation.**

The interference energy from the fluorescent lamp may be radiated from the line supplying the lamp to the radio antenna system and cause noise in this way. As with direct radiation from the lamp this line radiation is not effective for distances greater than ten feet, and it can thus be eliminated if the separation can be kept above this figure, or if the antenna lead or the power line is provided with a grounded shield in instances where they must be closer together than this.

It is also possible to eliminate line radiation by means of filters located at the lamp, Figures 3, 4 and 5. In many instances a simple capacitor filter is sufficient for this purpose, but in other instances an inductive-capacitor type filter may be required. Filters of both types are available from most radio supply stores.

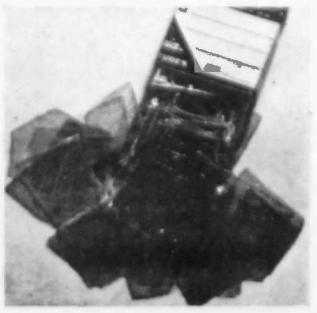
It is possible in some instances where appearance is not of major importance to eliminate interference from direct radiation by shielding the lamps with a grounded wire-mesh screen. This method is frequently used in radio repair shops where it is desired to mount a fluorescent fixture directly over the work table and is sometimes practicable in radio displays lighted from concealed lamps. The mesh of screen should be large enough so that it will not cut out an appreciable portion of the light and some arrangement should be devised so that it can be readily removed when the lamps must be changed. One-quarter inch mesh screen has been found satisfactory for this purpose.

**3. Feed Back Through the Lines.**

It is possible for the interference created by the lamp to feed back through the power lines supplying the lamps and reach the radio in this way. In some instances where the distance from the lamps to the radio connection is long enough, this interference energy will not reach the set and it is therefore frequently worth-while to try connecting the radio at the most remote point which is practicable under the particular conditions of the installation. The ballasts for 30, 40, and 100 watt lamps for 110-125 volt operation contains an auto-transformer which tends to cause some attenuation of radio energy and therefore this type of ballast is to be preferred in installations where radios are used. Interference due to line feed back can be effectively eliminated by means of filters. A single filter may be connected at the radio receiver but since filters connected at the lamps are also a protection against line radiation they are to be preferred unless the aerial circuit has already been shielded against bulb and line radiation. A larger number of filters may be required if they are located at the lamps. Frequently, however, it will be found that filters are required only at the lamps nearest to the radio.

• • •

## DID YOU GET YOUR MICA?



Many servicemen jumped at the chance to get a generous supply of high-grade mica at cost of handling (10¢). If you forgot to order yours, these kits are still available. The mica pieces are under 5/1000 of an inch thick, and can easily be cut to desired shape. It is the finest quality obtainable with low dielectric loss, and servicemen will find it just right for their needs. It is not a type needed in defense work, so we can offer it with a clear conscience. To order, send one dime to the Advertising Department, Hygrade Sylvania Corporation, Emporium, Pa.

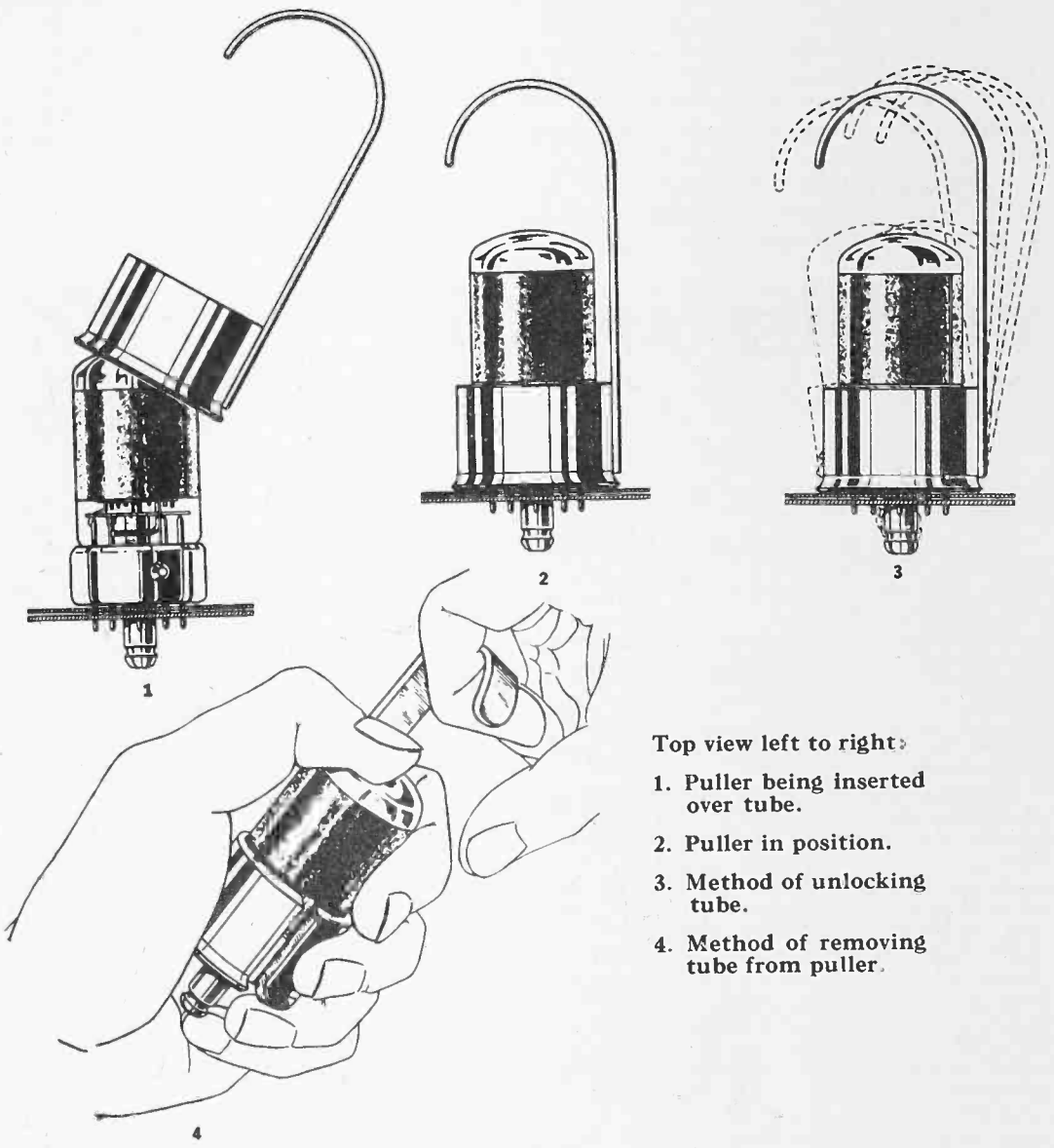
# SYLVANIA NEWS

## TECHNICAL SECTION




SEPTEMBER-OCTOBER, 1941 EMPORIUM, PENNA. Vol. 9, No. 5

# SYLVANIA "LOCK-IN" TUBE PULLER




Top view left to right:

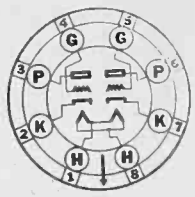
1. Puller being inserted over tube.
2. Puller in position.
3. Method of unlocking tube.
4. Method of removing tube from puller.

**Many servicemen have discovered that Sylvania "Lock-In" tubes live up to their name by remaining firmly anchored in the sockets. This is a distinct advantage, except when it becomes necessary to remove them. The Sylvania "Lock-In" Tube Puller, made of sturdy cadmium-plated metal, has been designed to do the job easily, without injury to tubes, hands or radio chassis. The illustrations above show the Puller and various steps in its use. Complete instructions are packed with each Puller.**

**Order from your Sylvania Jobber or direct from Emporium, Pa. Price 35c each.**

# TUBE DATA

## Sylvania Type 14F7 Duotriode Amplifier



8-AC

Sylvania Type 14F7 is a "Lock-In" duotriode designed especially for use as a phase inverter or as a voltage amplifier. It is the 14-volt equivalent of Type 7F7. The plate, grid and cathode of each triode section are brought out separately, thus permitting adaptations to special circuit requirements. The principal difference between the electrical characteristics of the 14F7 and other phase inverter tubes such as Types 6C8G and 6F8G is the higher value of amplification factor of each triode section.

For a-c service the 14-volt heater rating corresponds to a 130-volt line condition.

### CHARACTERISTICS

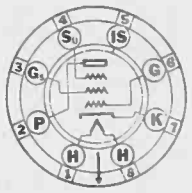
| | |
|---|---|
| Heater Voltage (Nominal) AC or DC | 14.0 Volts |
| Heater Current (Nominal) | 0.160 Ampere |
| Bulb | T9-G |
| Base—"Lock-In" 8-Pin | 8-AC |
| Mounting Position | Any |
| **RATINGS:** | |
| Heater Voltage (Nominal) AC or DC | 14.0 Volts |
| Heater Current (Nominal) | 0.160 Ampere |
| Plate Voltage | 250 Volts Max. |
| Plate Dissipation (per unit) | 1.0 Watt Max. |
| External Grid Bias Voltage | 0 Volt Min. |

### Operating Conditions and Characteristics:

Class A Amplifier (Each Triode)

| | |
|---|---|
| Heater Voltage | 12.6 Volts |
| Heater Current | 0.150 Ampere |
| Plate Voltage | 250 Volts Max. |
| Grid Voltage | −2 Volts |
| Plate Current | 2.3 Ma. |
| Plate Resistance (Approx.) | 4,400 Ohms |
| Mutual Conductance | 1,600 μmhos |
| Amplification Factor | 70 |

## Sylvania Type 14H7 Triple Grid Amplifier



8-V

Sylvania Type 14H7 is a "Lock-In" triple grid semi-remote cut-off amplifier identical with Type 7H7 except for heater rating.

Type 14H7 is particularly adapted for r-f and i-f stages in television and frequency modulation receivers where, due to the low impedance of the circuits and inherent low gain, the use of a tube of this type is highly advantageous.

### CHARACTERISTICS

| | |
|---|---|
| Heater Voltage (Nominal) AC or DC | 14.0 Volts |
| Heater Current (Nominal) | 0.160 Ampere |
| Bulb | T9-G |
| Base—"Lock-In" 8-Pin | 8-V |
| Mounting Position | Any |
| Direct Interelectrode Capacitances:* | |
| Grid to Plate | 0.007 μμf Max. |
| Input (G to all other Electrodes except P) | 8.0 μμf |
| Output (P to all other Electrodes except G) | 7.0 μμf |

*With standard RMA Tube Shield connected to cathode

(Continued on next page)

# TUBE DATA

(Continued from first page)

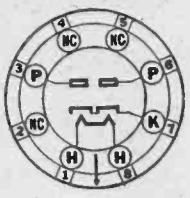
TYPE 14H7 (Continued)

**Operating Conditions and Characteristics:**

Class $A_1$ Amplifier

| | | |
|---|---|---|
| Heater Voltage | 12.6 | 12.6 Volts |
| Heater Current | 0.150 | 0.150 Ampere |
| Plate Voltage | 100 | 250 Volts |
| Screen Voltage | 100 | 150 Volts |
| Grid Voltage | -1 | -2.5 Volts |
| Suppressor and Internal Shield | 0 | 0 Volt |
| Plate Current | 8.2 | 9.5 Ma. |
| Screen Current | 3.3 | 3.5 Ma. |
| Plate Resistance | .0.25 | 0.8 Megohm |
| Mutual Conductance | 3800 | 3800 μmhos |
| Grid Voltage for Mutual Conductance of 35 μmhos (Approx.) | -12 | -19 Volts |

## Sylvania Type 14Y4 Full-Wave Rectifier




5-AB

Sylvania Type 14Y4 is a full-wave rectifier of "Lock-In" construction. It is practically the same as the 7Y4 except for heater ratings and output current which is slightly higher for Type 14Y4. The conventional full-wave circuit may be used, while for half-wave service the two plates may be tied together at the socket.

**CHARACTERISTICS**

| | |
|---|---|
| Heater Voltage (Nominal) AC or DC | 14.0 Volts |
| Heater Current (Nominal) | 0.320 Ampere |
| Bulb | T9-G |
| Base—"Lock-In" 8-Pin | 5-AB |
| Mounting Position | Any |
| RATINGS: | |
| Heater Voltage (Nominal) AC or DC | 14.0 Volts |
| Heater Current (Nominal) | 0.320 Ampere |
| A-C Voltage Per Plate (RMS) Condenser Input | 325 Volts Max. |
| A-C Voltage Per Plate (RMS) Choke Input | 450 Volts Max. |
| Peak Inverse Voltage | 1,250 Volts Max. |
| D-C Heater to Cathode Voltage | 450 Volts Max. |
| Steady-State Peak Plate Current Per Plate | 210 Ma. Max. |
| D-C Voltage Drop at 60 Ma. Per Plate | 22 Volts |

**Operating Conditions and Characteristics:**

FULL-WAVE RECTIFIER

Condenser Input to Filter

| | |
|---|---|
| Heater Voltage | 12.6 Volts |
| Heater Current | 0.3 Ampere |
| A-C Plate Voltage per Plate (RMS) | 325 Volts |
| D-C Output Current | 70 Ma. Max. |
| Plate Supply Impedance per Plate# | 150 Ohms Min. |

Choke Input to Filter

| | |
|---|---|
| Heater Voltage | 12.6 Volts |
| Heater Current | 0.3 Ampere |
| A-C Plate Voltage Per Plate (RMS) | 450 Volts |
| D-C Output Current | 70 Ma. Max. |
| Minimum Value of Input Choke | 8 Henrys |

#When filter condensers larger than 40 mfds. are used, it may be necessary to add additional plate supply impedance.

• • •

## Discontinued Types

The last Technical Section gave information on eight Sylvania tube types that had been discontinued. Since then, thirteen additional regularly listed types have been withdrawn. It may be that some of these types are still available from your Sylvania Jobber, but only until his supply is exhausted. The discontinued types are as follows:

| | |
|---|---|
| **00A** | Special Detector |
| **2** | Plug-In Resistor |
| **3** | Plug-In Resistor |
| **4** | Plug-In Resistor |
| **5** | Plug-In Resistor |
| **6** | Battery Ballast |
| **7** | Plug-In Resistor |
| **8** | Plug-In Resistor |
| **9** | Plug-In Resistor |
| **40** | Voltage Amplifier |
| **46A1** | Plug-In Resistor |
| **46B1** | Plug-In Resistor |
| **401** | Detector-Amplifier |

# A CHAT WITH ROGER WISE

Chief Tube Engineer
Hygrade Sylvania Corporation

The increased acceptance being won by "Lock-In" tubes among set and equipment manufacturers is very gratifying, coming as it does at a time when conditions are unsettled and new trends are appearing. In many cases a step-up in performance is obtained when a "Lock-In" complement replaces other types. A gain of this kind is particularly important at a time when changes in materials entering into set design may be necessary due to current shortages.

While "Lock-In" tube quality is well seasoned through several years of production and field experience, they do represent the most modern and up-to-date line of radio tubes available today. The many novel features secured by the radical improvements incorporated in them include those features stressed in advertising copy—the single-end construction, short lead length, elimination of soldered connections, internal shielding, locking lug, sturdy construction, etc. The circuit conditions may be such that one of these features will be helpful in securing improved performance, or several may be of importance.

The high frequency performance of many of the "Lock-In" types is especially good, and the standard design can also be modified to advantage in some cases by comparatively simple changes which extend the operating range still higher. With the trend toward the use of higher and higher frequencies being accelerated by defense requirements, these design advantages become especially important. Very interesting results under severe vibration and shock have been secured, again due to "modern design."

The slogan which designates the "Lock-In" tube as the tube which "has all the answers" does not seem to be an exaggeration in view of the advantages secured in this ultra-modern radio tube.

• • •

# THE CAUSE AND CURE OF FILAMENT FAILURES

FRANK D. LANGSTROTH, Comm. Eng. Dept. Sylvania Tube Division

"It's only an open filament! All you need is a new tube!"

How many times have you said that to a customer? Perhaps a great many, for it is true that a large number of service calls are due to open filament tubes.

It was easy for you to slip in a new tube and let it go at that; but, when you heard the tone of your customer's voice a short time later informing you that the very same thing had happened all over again, were you embarrassed?—We suppose that depended on how much you charged the customer!

Had you realized that in the majority of cases, open filaments do not "JUST HAPPEN" but are "CAUSED" you would not have merely been satisfied with replacing a tube, but you would have found the cause and cured it—for certainly you value your reputation as a serviceman and the good will of your customers!

It is therefore the purpose of this article to present a few of the filament problems encountered in radio servicing, hoping to make them recognizable and to suggest simple cures which will enable you, the serviceman, to have a better understanding of what have appeared to be complications in the past.

Modern radio tubes are indeed very rugged when one considers the exacting requirements under which they must function in their various applications. However, there are a few problems which must be given careful consideration if long life and best results are to be assured.

One of these problems is the importance of OPERATING AND MAINTAINING the filament voltage within the published ratings of the tubes!

This problem sounds very simple—so simple in fact that we ignore it. We take it for granted that if a series of 1.4 volt tube filaments total six volts and we place six volts across it everything is perfect; or if a 150 ma. series adds up to the line voltage, why not put it directly across the line? Well, why not? We will take this problem first.

We will say that one of your customers has an ac-dc receiver, with a filament circuit like that in Figure 1, in which he continues to find open filament tubes—sometimes it is the 12SQ7, sometimes it is the 12SK7. Your customer is vexed over the whole situation. You have tested the voltage across the various filaments and they are within the published limits. The total filaments in series adds to 121 volts and your line voltage is only 115 volts. Everything

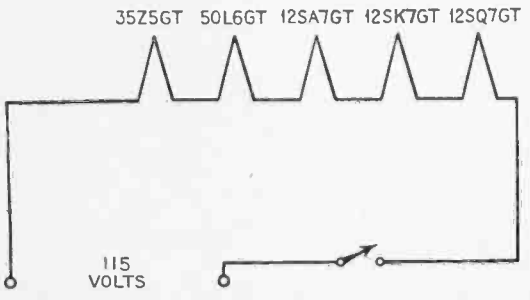
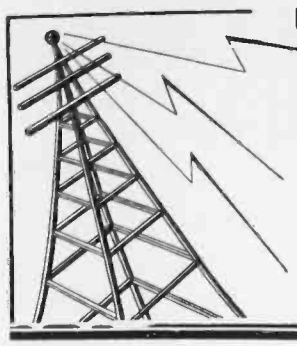



FIGURE 1

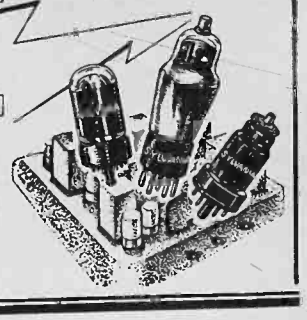
looks good to you. Why in "Sam Hill" do they "pop" out? Well, suppose we start taking measurements on this set again and place a voltmeter across the filament of one of the 12 volt tubes and turn the set on—Wow! For a few seconds the filament voltage goes up to 26 volts and then gradually goes down to 12 volts. It is this initial surge voltage that causes the filaments to open! But why do we have this condition?

The filament circuit of a typical ac-dc receiver is shown in Figure 1. There are five tubes having their filaments in series so that the total voltage will equal the line voltage across which the series string is connected.

(Continued on page 4)



# The SERVICE EXCHANGE



THE information presented in the Sylvania Service Exchange is contributed by service men as the result of practical experience. It is very carefully considered before being accepted, and we believe it to be correct and authentic. However, we assume no responsibility with respect to results. Each hint accepted entitles the writer to his choice of one Sylvania receiving tube. Please indicate preference when submitting hints. Don't send routine or generally known information. Please specify tube choice.

**Airline Models 62-274, 62-288, 62-290.** Lack of volume and severe distortion. Tubes and voltages check perfect. Replace the 6A8G with a Sylvania 6A8G and get the surprise of your life. Experience has been with no less than eight of these sets.—Bob's Radio Service, Saugerties, New York.

* * *

**Arvin Model 510.** In this compact auto radio there is often excess vibrator "hash" which is very difficult to reduce to a suitable level. Remedy: The gang condenser is held to chassis by three rubber grommets and the gang is not grounded thoroughly. Solder a braid wire from gang to chassis which will reduce the "hash" 75%.—Mr. B. Wattris, Oneida, Tenn.

* * *

**Chrysler Auto Radio, Philco Model C-1708.** When there is weak reception on all stations, check the .01 condenser from plate of the 7B6 to the grid of the 7B5 tube for high resistance. If there is no reception at the low end of the dial and stations near 550 Kc. come in around 900 Kc. replace the oscillator coil and realign.

Shorted filter condenser No. 61-0089 should be replaced with part No. 61-0028 instead of original part. This will overcome breakdowns due to surges of car voltages.—Baer Radio Service, Roslindale, Mass.

* * *

**Circuit Data Reference.** To save time on repeat service jobs, mark the manual data reference on the chassis in easily seen places, on back or top, and on the under side of the chassis. I use the schematic page number such as 8-103, 4-1, etc. If data are under a different name than the radio. preceed figures with RCA, BRC, CRT, etc. The next time you want the data on these sets you don't need to refer to the index.—Ralph H. Mercer, Lake Worth, Fla.

* * *

**Emerson Model DP-332.** When trouble is experienced with low volume, or only local stations can be received at half volume settings, try replacing the 500,000 ohm volume control part #6SR-362. These controls usually check OK but fail when in operation.—P. F. Adams, Cleveland, Ohio.

* * *

**Lafayette Model T56.** When this AC-Battery portable is dead on AC, but plays perfectly on batteries, the trouble can usually be traced to the bleeder resistor mounted on top of chassis in back of dial. If unable to obtain a duplicate replacement, a 2500 ohm wire wound 10 watt resistor can be substituted for original with perfect results.—Elliott J. Dullea, Phila., Pa.

* * *

**Motorola Turntable Speed.** If a Model 23RC turntable revolves too fast, speed can be readily reduced by grinding the motor bushing down with emery paper. Remove the turntable, and loop a small strip of very fine emery paper around the motor bushing. Then turn the motor on and let it run. Check speed frequently. A few thousandths of an inch is all you need to reduce diameter, and it doesn't take long to grind that much off.—Motorola Service Bulletin.

* * *

**Motorola Model 60.** This model has the .01 mfd. tone condenser mounted next to the power tube. Because of this the condenser often goes bad. When replacing, use a .05 mfd., 600 volt unit for a more pleasing tone. Mount it inside of the chassis instead of original mounting position.—Sellers Radio Service, Akron, Ohio.

**Motorola Models 451 and 551.** The installation man can do a lot to forestall tuner sticking in Models 451 and 551, if he will pay close attention to several important details.

**Flexible Tuning Shafts**—It is important that the tuning shaft turns freely with a minimum of binding. Binding shafts cause sluggish tuner operation, which in turn prevents the slight kick back of the motor armature that disengages the latch bar.

When installing the set, the cables should be routed in easy arcs. Sharp bends, which cause binding, should be eliminated. **If there is any tendency to bind whatsoever, use Motorola Record Changer Grease inside the cable, as a lubricant.** It is also important to anchor flexible shafts securely. Unless this is done, the cable will vibrate while driving and cause the radio to become constantly detuned.

**Low Voltage**—Low voltage will also cause latch bars to stick. The motor turns slowly and fails to kick back enough to disengage the latch. Measure the voltage in the car at the point where the "A" lead is connected. Make the measurements under full load with the set turned "ON" and a push-button depressed. The full load of about 15 amps. will result in a severe voltage drop if the car manufacturer has used a small wire between the battery and the point where the "A" lead connects. In many modern cars you will find this to be true. If the voltage is low at the ignition switch, try the ammeter, or if necessary, the starter switch. A minimum of 5½ volts is desirable under load

**Locking Screw**—When a new set is installed, do not press push-buttons indiscriminately. Instead, loosen the locking screw and go through the correct procedure for setting up push-buttons. **Then tighten the locking screw very securely.** Failure to do so may result in damage to the split gear on the condenser gang.

By carefully following the above recommendation, field trouble can be materially reduced.—Motorola Service Bulletin.

* * *

**Motorola Model 700.** If this model has excessive ripple, try the following:

1. Dress the grid lead of the 6Q7GT driver tube around the tube shield, away from the power transformer.
2. Cut the heavy bond which runs from the ground terminals of the driver tube socket to the volume control. This will leave the only ground connection between the two that which is made through the chassis base.—Motorola Service Bulletin.

* * *

**Philco Model 41-608.** When mechanical vibration and howl are encountered in this radio phono combination, make sure shipping bolts have been loosened on chassis and motor. Also replace light in tone arm with a new light. These lights must have a very rigid filament or the vibration will be transferred to the amplifier and reproducer. Place small pieces of soft rubber (fasten with cement) in tone arm back of tone arm head to dampen vibration.—Meyers Radio Service, Ironton, Ohio.

* * *

**Philco Model 630.** Set screeches for a few seconds, then goes dead. Turning set on and off brings back reception. Look for tone control condenser that breaks down intermittently.—Earle W. Meredith, Rochester, N. Y.

* * *

**RCA U126.** You will find condenser C31, mounted directly from the front section of the tuning condenser to the band switch, in a rigid position. With the tuner dancing on each station change, the inner connections of C31 work loose. This causes the oscillator to stop, also noise. Replace so that leads of C31 are able to move with tuner.—C. A. Vaughn, Los Angeles, Calif.

* * *

**Stromberg-Carlson Models 505, 515.** Weak signal or no signal on the F. M. band of either of these receivers manufactured prior to October 1940 may be caused by the 22,000 ohm resistor R-8 connected between ground and the second i-f transformer heating up and changing in value. In most cases, this condition can be rectified by simply removing this resistor from the circuit

If regeneration or oscillation does occur after this resistor has been removed, connect a 22,000 ohm resistor between ground and the secondary of the second i-f transformer.—Stromberg-Carlson Service Dept.

## SPECIAL OFFER


**During the month of November, one box of ten panel lamps in addition to the regular choice of one receiving tube will be given for each radio service hint accepted. You may have your choice of any panel lamp number and receiving tube type number. Hints may apply to mechanical, electrical or the selling end of radio. Do not send routine or generally known information. Please specify your choice of panel lamp and tube type. The hints accepted during this period will be used for Volume IV Service Hints Booklet. All hints submitted during December on coin operated phonographs, if accepted, will entitle the contributor to one Panel Lamp Kit (an assortment of 60 Panel Lamps) for the first hint accepted and one tube for each additional phono hint accepted.**

# THE CAUSE AND CURE OF FILAMENT FAILURES

(Continued from page 2)

FRANK D. LANGSTROTH, Comm. Eng. Dept. Sylvania Tube Division

If we visualize each filament as being a resistor, we can better understand the functions of this circuit. In other words, the filaments of the first, second, third, and fourth tubes act as a resistor to cut the voltage down to its proper value for the fifth tube, while the first, second, third and fifth filament is the dropping resistor for the fourth tube, and so on. We always have four filaments acting as the ballast resistor for the fifth as shown in Figure 2.

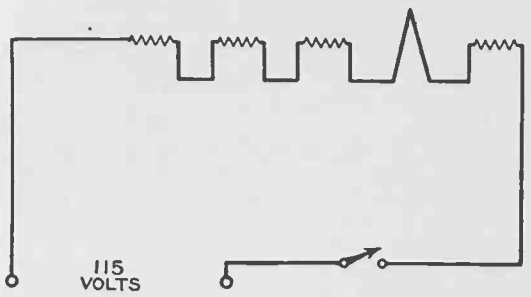



FIGURE 2

According to Ohm's Law everything should work fine with this circuit, and it would if it were not for one condition. The resistance of the filaments which we are using as dropping resistors is variable—it varies with temperature.

When the filaments are first turned on the resistance is low because the tubes are cold and as they become hot, the resistances increases to a steady value.

This would not be a bad condition at all, providing all the filaments reached their steady value at the same time; but we have tubes of various voltages in the series string, and the higher voltage filaments have a greater mass to heat, thus causing them to have a slower heating time than the low voltage filaments.

The result is that we do not have sufficient ballast for the low voltage tubes which have already reached their operating temperature. This causes a higher voltage to appear across their filaments until the resistance of the high voltage filaments have reached their steady or high value. The heating time of the high voltage filaments is further reduced because the high resistance of the now too hot low voltage filaments reduces the voltage applied to the higher voltage tubes.

It can be seen, therefore, that something is necessary to keep the line voltage reduced until the tubes are warmed up. This can be easily done by inserting a small resistor in series with the line voltage and the filament string.

This protective resistor tends to function automatically. As the resistance of the series filament string is very low when the receiver is first turned on, there will be a high current drain through the resistor which will cause a large voltage drop, thereby reducing the voltage applied across the filaments. When the tubes are hot the resistance of the filaments increases, thus reducing the current through the resistor and allowing more voltage for the series filaments.

The application of this protective resistor will naturally drop the filament voltage a few volts, but this should in no way affect the functioning of the receiver, as the loss of voltage will be distributed amongst the five filaments.

The increasing popularity of the battery-operated receiver has no doubt caused you numerous headaches.

We often find open filament tubes and continue to wonder why, especially when some of these tubes have been replaced two or three times.

In sets designed for both battery and ac-dc operation, it is usually necessary that the filaments of the tubes be operated in series during operation from the power line. Series operation is also frequently employed for battery operation to simplify switching.

There appears to be nothing wrong with this type of circuit. We see no reason why we cannot series operate tube filaments providing, of course, their currents are the same. Here again, however, there exists a condition which was not always taken into consideration in early receiver designs of this kind. The fact that the tubes have plate and screen voltages applied to them was often ignored. The total "B" current consumed by the tubes must return to "B"—and the only way that it can take place is by passing through the filament string, thus adding additional current, which at times is sufficient to cause the tube filaments to open.

In series connected filaments, therefore, the difference between the filament current at each end of the string must be the total "B" current, most of which is contributed by the power output tube which is placed at the positive end of the string so that its bias may be obtained by returning the grid to the negative end of the filament string.

The way the "B" current divides between the "A+" and the "A−" circuits depends upon the resistance of these circuits.

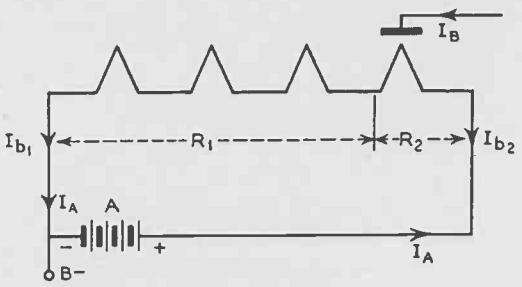



FIGURE 3

For the circuit in Figure 3, this division of the "B" current can be expressed as:

$$\text{Percent } I_b \text{ in A+ circuit} = I_b \frac{(R_1)}{R_1+R_2}$$

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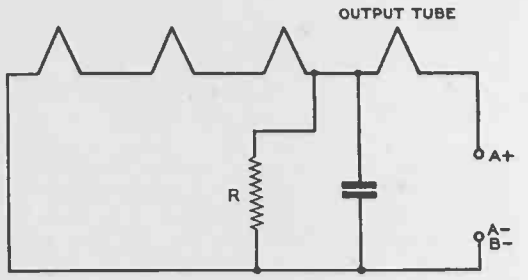
It is apparent that in a-c operation where "A+" is connected through a large dropping resistor, practically all of the current flows out of the negative end of the filament string.

Therefore, during a-c operation it is desirable to shunt the "B" current of the power tube around the other tube filaments, especially if a tube of high "B" current is used.

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This may be done by a suitable resistor "R" as shown in Figure 4. This shunting resistor will equalize the current in the tube filaments for both line and battery operation.

To provide complete protection, the last "A" filter condenser should be placed directly across the shunting resistor. Thus the resistor also serves as a "bleeder" upon the last filter condenser in the "A" filter circuit and prevents this condenser from being subjected to excessive voltage when a tube is removed from the set while operating on a-c for, if the condenser is not damaged, the charge accumulated is sometimes sufficient to burn out several tubes when the filament circuit is again established upon the insertion of a tube. Although this connection allows some a-c ripple to flow through the output tube filament, the amplification is not high enough to render it objectionable.

The filter condenser serves two purposes when used in this position, one as the "A" filter and the other to prevent modulation currents of the output tube from passing through the filament string into the r-f tubes. This condenser must be of high capacity, from 100 to 200 mfd. in order to effectively by-pass the audio component of the total plate, screen and filament current of the output tube.

In receiver designs where the output tube is of the double filament type, extreme care should be taken to see that each 1.4 volt section carries an equal share of the total cathode current. Generally the negative section receives the greatest amount. This will necessitate the use of a resistor of approximately 250 ohms parallel with the negative section or a suitable resistor may be used between the filament center tap and −A to secure equalization.

In order to provide more power output when a-c operated, a separate output tube is sometimes used whose cathode current is returned through the remaining 1.4 volt tubes and thus provides their filament current. Some of these sets subject the 1.4 volt tubes to a severe surge of filament current if the set is switched suddenly from a-c to battery operation. This results from the fact that the cathode of the a-c power output tube remains hot long enough to provide additional current from the "B" battery to flow through the 1.4 volt filaments which are now being supplied from the "A" battery.

Although the 1.4 volt tubes will operate over a wide range of filament voltages, care should be exercised to see that the filament circuits are equalized in order to prevent excessive surges.

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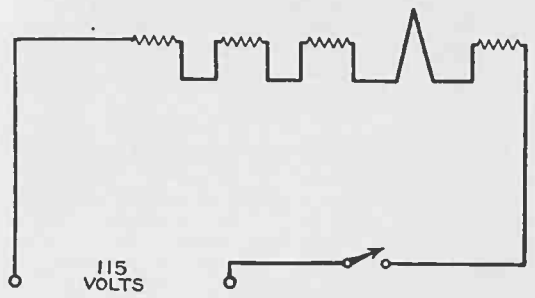


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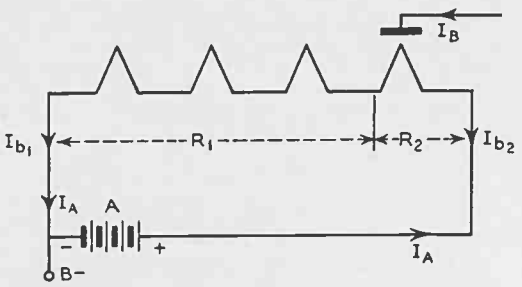


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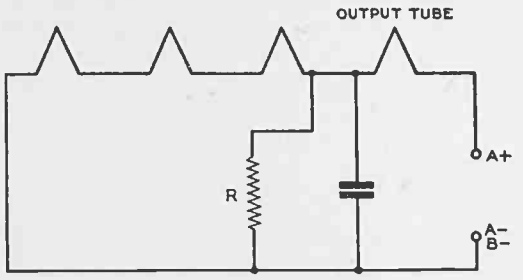


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