60 SYLVANIA ECG SEMICONDUCTOR TYPES REPLACE 28,000 TYPES

The advent of solid-state devices and their constantly increasing use in entertainment electronic equipment have created some problems over the years for the service technician. Once the technical know-how had been acquired which permitted isolating the set malfunction down to the defective semiconductor, the problem became one of securing a suitable replacement type. This could be especially difficult if the equipment was built by an "off-shore" manufacturer or the part number looked like a combination zip code and telephone number.

Compounding the replacement problem has been the rapid proliferation of solid-state device types, making it nearly impossible for the parts distributor or service technician to maintain a reasonably representative number of types in stock. Unless the service technician is located in an area where the particular set manufacturer has a parts depot, the time consumed in obtaining the replacement part could prove to be extensive—and irritating to both customer and technician.

To alleviate this situation, Sylvania has evolved a high-quality line of replacement semiconductor devices and made them available through the Sylvania Electronic Tube Distributors who now serve your electron tube and other parts needs. Each replacement type is prefixed by the letters ECG followed by a three-digit number. Sylvania ECG semiconductors are intended to minimize the number of replacement parts the service technician must stock and yet meet the replacement needs of the wide variety of entertainment equipment which he encounters.

All 60 types of these ECG devices are available in regular carton pack or display pack.

As an invaluable aid in finding the Sylvania semiconductor device to fill your particular replacement need, we have just completely revised the Sylvania ECG Semiconductor Replacement Guide/Catalog, identified as ECG212B, which cross references approximately 28,000 JEDEC types and manufacturers' part numbers to the Sylvania semiconductor replacement type. This 67-page guide is now the most comprehensive in the industry and will be periodically revised as the need arises; it is available from Sylvania Electronic Tube Distributors.

Also recently introduced is a solid state repair kit, the ECG303, containing the new ECG212B Replacement Guide and 24 of the most commonly used semiconductors from the replacement line—packaged small enough to fit into your tube caddy and replacing about 15,000 types. Rounding out the line is a group of accessories, which includes such items as transistor sockets, pilot lamp assemblies, miniaturized circuit breakers, etc.

Brief descriptions of the ECG replacement semiconductors and their technical data are provided on the following pages.
**technical data / TRANSISTORS**

MAXIMUM RATINGS AT 25° C AMBIENT UNLESS OTHERWISE NOTED

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Applications</th>
<th>Collector-Base Voltage (BVCEO)</th>
<th>Collector-Emitter Voltage (BVCEO)</th>
<th>Base Emitter Current (VBEBO)</th>
<th>Max. Collector Current</th>
<th>Max. Collector Dissipation</th>
<th>Typical Current Gain (Hz)</th>
<th>Package Basing</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECG100</td>
<td>PNP-Germanium</td>
<td>RF Amp, Oscillator, Mixer, IF Amp of AM Radios</td>
<td>25V</td>
<td>20V (CER) min</td>
<td>20.0V</td>
<td>300 Ma</td>
<td>150 Mw</td>
<td>30 (at 455 KHz)</td>
<td>TO-5</td>
</tr>
<tr>
<td>ECG101</td>
<td>NPN-Germanium</td>
<td>RF Amp, Oscillator, Mixer, IF Amp of AM Radios</td>
<td>25V</td>
<td>20V (CER) min</td>
<td>20.0V</td>
<td>300 Ma</td>
<td>150 Mw</td>
<td>40 (at 455 KHz)</td>
<td>TO-3</td>
</tr>
<tr>
<td>ECG102</td>
<td>PNP-Germanium</td>
<td>Audio Driver, pre-amp, Power Output</td>
<td>30V</td>
<td>16V (CER) min</td>
<td>20.0V</td>
<td>250 Ma</td>
<td>150 Mw</td>
<td>90 (at 1 KHz)</td>
<td>TO-5</td>
</tr>
<tr>
<td>ECG103</td>
<td>NPN-Germanium</td>
<td>Audio Driver, pre-amp, Power Output</td>
<td>30V</td>
<td>16V (CER) min</td>
<td>20.0V</td>
<td>250 Ma</td>
<td>150 Mw</td>
<td>90 (at 1 KHz)</td>
<td>TO-5</td>
</tr>
<tr>
<td>ECG104</td>
<td>PNP-Germanium</td>
<td>Audio Power Output</td>
<td>50V</td>
<td>35V (CER) min</td>
<td>20.0V</td>
<td>7 Amps</td>
<td>90 Watts</td>
<td>90</td>
<td>TO-3</td>
</tr>
<tr>
<td>ECG104MP</td>
<td>PNP-Germanium</td>
<td>Audio Power Output</td>
<td>30V</td>
<td>20V</td>
<td>5.0V</td>
<td>500 Ma</td>
<td>150 Mw</td>
<td>150 Mw</td>
<td>TO-6</td>
</tr>
<tr>
<td>ECG105</td>
<td>PNP-Germanium</td>
<td>Audio Power Output</td>
<td>50V</td>
<td>35V (CER) min</td>
<td>20.0V</td>
<td>15 Amps</td>
<td>100 Watts</td>
<td>90</td>
<td>TO-16</td>
</tr>
<tr>
<td>ECG106</td>
<td>PNP-Silicon</td>
<td>RF Amp, Oscillator, Mixer, IF Amp, All Band and FM Radios</td>
<td>35V</td>
<td>15V min</td>
<td>1.0V</td>
<td>75 Ma</td>
<td>250 Mw</td>
<td>20 min</td>
<td>TO-18</td>
</tr>
<tr>
<td>ECG107</td>
<td>NPN-Silicon</td>
<td>RF Amp, Oscillator, Mixer, IF Amp in UHF and VHF Applications</td>
<td>35V</td>
<td>15V min</td>
<td>1.0V</td>
<td>75 Ma</td>
<td>250 Mw</td>
<td>20 min</td>
<td>TO-92</td>
</tr>
<tr>
<td>ECG108</td>
<td>NPN-Silicon</td>
<td>RF Amp, Oscillator, at VHF, UHF, IF Amp, Audio Amp</td>
<td>35V</td>
<td>15V min</td>
<td>0.5V</td>
<td>75 Ma</td>
<td>250 Mw</td>
<td>10 min</td>
<td>RO-97A</td>
</tr>
<tr>
<td>ECG109</td>
<td>PNP-Germanium</td>
<td>Audio Power Output for Stereo and Hi-Fi, etc.</td>
<td>65V</td>
<td>45V (CER) min</td>
<td>15.0V</td>
<td>7 Amps</td>
<td>90 Watts</td>
<td>80</td>
<td>TO-3</td>
</tr>
<tr>
<td>ECG112</td>
<td>NPN-Silicon</td>
<td>Audio Pre-Amp, Driver, Video Amp, Sync Separator</td>
<td>30V</td>
<td>20V</td>
<td>5.0V</td>
<td>500 Ma</td>
<td>500 Mw</td>
<td>150 Mw</td>
<td>TO-5</td>
</tr>
<tr>
<td>ECG1126</td>
<td>NPN-Silicon</td>
<td>High Voltage Audio Power Output for 120 Volt Line Operated TV, Phonos, Stereo, etc.</td>
<td>300V</td>
<td>300V</td>
<td>5.0V</td>
<td>400 Ma</td>
<td>10 Watts</td>
<td>140</td>
<td>TO-66</td>
</tr>
<tr>
<td>ECG1127</td>
<td>PNP-Germanium</td>
<td>RF Amp, Oscillator, Mixer, IF Amp for All Band Radios and VHF Service</td>
<td>25V</td>
<td>25V</td>
<td>2.0V</td>
<td>200 Ma</td>
<td>200 Mw</td>
<td>60</td>
<td>TO-24</td>
</tr>
<tr>
<td>ECG1128</td>
<td>PNP-Germanium</td>
<td>Horizontal and Vertical Deflection Amplifiers---Audio Power Output</td>
<td>350V</td>
<td>350V (CES)</td>
<td>2V</td>
<td>10 Amps</td>
<td>56 Watts</td>
<td>15 Min.</td>
<td>TO-3</td>
</tr>
<tr>
<td>ECG1129</td>
<td>PNP-Silicon</td>
<td>Audio Pre-Amp, Driver Output Video Amplifier</td>
<td>100V</td>
<td>8V (CER)</td>
<td>7V</td>
<td>1.0 Amps</td>
<td>1 Watt</td>
<td>90</td>
<td>TO-5</td>
</tr>
<tr>
<td>ECG1130</td>
<td>PNP-Silicon</td>
<td>Audio Pre-Amp, Driver Output Video Amplifier</td>
<td>100V</td>
<td>8V (CER)</td>
<td>7V</td>
<td>1.0 Amps</td>
<td>1 Watt</td>
<td>90</td>
<td>TO-5</td>
</tr>
<tr>
<td>ECG1130MP</td>
<td>PNP-Silicon</td>
<td>Audio Power Amplifier</td>
<td>30V</td>
<td>60V (CER)</td>
<td>5V</td>
<td>15 Amps</td>
<td>115 Watts</td>
<td>20</td>
<td>TO-3</td>
</tr>
<tr>
<td>ECG1131</td>
<td>PNP-Germanium</td>
<td>Audio Power Output Auto Radio, Auto Stereo Tape Players, etc.</td>
<td>32V</td>
<td>20V</td>
<td>10V</td>
<td>3 Amps Peak</td>
<td>6 Watts (63°C)</td>
<td>110</td>
<td>Similar to TO-66</td>
</tr>
<tr>
<td>ECG1131MP</td>
<td>PNP-Germanium</td>
<td>Audio Power Output Auto Radio, Auto Stereo Tape Players, etc.</td>
<td>32V</td>
<td>20V</td>
<td>10V</td>
<td>3 Amps Peak</td>
<td>6 Watts (63°C)</td>
<td>110</td>
<td>Similar to TO-66</td>
</tr>
<tr>
<td>ECG1132</td>
<td>NPN-Silicon</td>
<td>Audio Power Output</td>
<td>60V</td>
<td>60V</td>
<td>5V</td>
<td>3 Amps</td>
<td>40 Watts</td>
<td>60</td>
<td>'P-66'' (Plastic)</td>
</tr>
<tr>
<td>ECG1133</td>
<td>PNP-Silicon</td>
<td>Audio Power Output</td>
<td>60V</td>
<td>60V</td>
<td>5V</td>
<td>3 Amps</td>
<td>40 Watts</td>
<td>60</td>
<td>'P-66'' (Plastic)</td>
</tr>
<tr>
<td>ECG1134</td>
<td>NPN-Silicon</td>
<td>Color/BW TV Video Output Amplifier</td>
<td>100V</td>
<td>100V</td>
<td>7V</td>
<td>50 Ma</td>
<td>1.0 Watts (25°TA)</td>
<td>1.0 Watts (25°TC)</td>
<td>TO-39</td>
</tr>
<tr>
<td>ECG1135</td>
<td>NPN-Germanium</td>
<td>Audio Power Amplifier</td>
<td>32V</td>
<td>20V</td>
<td>10V</td>
<td>3 Amps Peak</td>
<td>7.5 Watts</td>
<td>110</td>
<td>Similar to TO-66</td>
</tr>
</tbody>
</table>

**FIELD EFFECT TRANSISTORS—N—Channel Junction Types**

<table>
<thead>
<tr>
<th>Type</th>
<th>Application</th>
<th>Trans-Conductance (µMhos)</th>
<th>Drain Source Voltage VDS (Volts)</th>
<th>Current (MA d.c.)</th>
<th>Gate-Source Breakdown Voltage V(8R) GSS (Volts)</th>
<th>Gate Reverse Current IGSS (mA d.c.)</th>
<th>Zero-Gate Voltage Drain-CURRENT IDSS (mA d.c.)</th>
<th>Total Device Dissipation (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECG132</td>
<td>R.F. Amplifier and Mixer into the VHF Region</td>
<td>2000 Min. at 100 MHz</td>
<td>25</td>
<td>10 Ig</td>
<td>25</td>
<td>2</td>
<td>2-20</td>
<td>200</td>
</tr>
<tr>
<td>ECG133</td>
<td>General Purpose Audio Amplifier and Switch</td>
<td>4000 Typical</td>
<td>25</td>
<td>10 Ig</td>
<td>25</td>
<td>1</td>
<td>0.5-15</td>
<td>300</td>
</tr>
</tbody>
</table>
**DIODES and RECTIFIERS**

<table>
<thead>
<tr>
<th>TYPE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECG109</td>
<td>Germanium general purpose 75 volt P.R.V.</td>
</tr>
<tr>
<td>ECG110</td>
<td>Germanium matched pair</td>
</tr>
<tr>
<td>ECG111</td>
<td>Silicon UHF TV mixer diode</td>
</tr>
<tr>
<td>ECG112</td>
<td>Silicon UHF TV mixer diode</td>
</tr>
<tr>
<td>ECG113</td>
<td>Selenium dual diode common cathode TV horizontal AFC</td>
</tr>
<tr>
<td>ECG114</td>
<td>Selenium dual diode series connected TV horizontal AFC</td>
</tr>
<tr>
<td>ECG115</td>
<td>Selenium dual diode common anode TV horizontal AFC</td>
</tr>
<tr>
<td>ECG116</td>
<td>Silicon rectifier 600 volt P.R.V. 1.00 amp (d.c. resistive)</td>
</tr>
<tr>
<td>ECG117</td>
<td>Silicon rectifier 600 volt P.R.V. 1.0 amp (d.c. resistive) max</td>
</tr>
<tr>
<td>ECG118</td>
<td>Selenium color TV focus rectifier—peak reverse voltage 6500</td>
</tr>
<tr>
<td>ECG119</td>
<td>Selenium color TV boost rectifier—peak reverse voltage 800, d.c. output current, 2 MA resistive</td>
</tr>
<tr>
<td>ECG120</td>
<td>Selenium color TV convergence rectifier—peak reverse voltage 38 V, RMS voltage 12, output current 65 MA</td>
</tr>
<tr>
<td>ECG125</td>
<td>Silicon rectifier 1000 volt P.R.V. 1.0 amp (d.c. resistive)</td>
</tr>
</tbody>
</table>

**ZENER DIODES**

<table>
<thead>
<tr>
<th>Type</th>
<th>Nominal Zener Voltage Vz at Izr (volts)</th>
<th>Test Current Izr (Ma)</th>
<th>Zener Impedance Zzr at Izr (ohms)</th>
<th>D.C. Zener Current Izr (Ma)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECG134</td>
<td>3.6</td>
<td>69</td>
<td>11.0</td>
<td>252</td>
</tr>
<tr>
<td>ECG135</td>
<td>5.0</td>
<td>50</td>
<td>8.0</td>
<td>182</td>
</tr>
<tr>
<td>ECG136</td>
<td>5.6</td>
<td>45</td>
<td>6.0</td>
<td>162</td>
</tr>
<tr>
<td>ECG137</td>
<td>6.2</td>
<td>41</td>
<td>3.0</td>
<td>146</td>
</tr>
<tr>
<td>ECG138</td>
<td>7.5</td>
<td>33</td>
<td>6.0</td>
<td>120</td>
</tr>
<tr>
<td>ECG139</td>
<td>9.1</td>
<td>28</td>
<td>6.0</td>
<td>95</td>
</tr>
<tr>
<td>ECG140</td>
<td>10.0</td>
<td>25</td>
<td>7.0</td>
<td>85</td>
</tr>
<tr>
<td>ECG141</td>
<td>11.5</td>
<td>22</td>
<td>9.0</td>
<td>78</td>
</tr>
<tr>
<td>ECG142</td>
<td>12.0</td>
<td>21</td>
<td>10.0</td>
<td>76</td>
</tr>
<tr>
<td>ECG143</td>
<td>12.8</td>
<td>19</td>
<td>11.0</td>
<td>79</td>
</tr>
<tr>
<td>ECG144</td>
<td>14.0</td>
<td>18</td>
<td>13.0</td>
<td>65</td>
</tr>
<tr>
<td>ECG145</td>
<td>15.0</td>
<td>17</td>
<td>15.0</td>
<td>56</td>
</tr>
<tr>
<td>ECG146</td>
<td>27.0</td>
<td>9.5</td>
<td>36.0</td>
<td>30</td>
</tr>
<tr>
<td>ECG147</td>
<td>33.0</td>
<td>7.5</td>
<td>46.0</td>
<td>26</td>
</tr>
<tr>
<td>ECG148</td>
<td>55.0</td>
<td>4.5</td>
<td>110.0</td>
<td>16</td>
</tr>
<tr>
<td>ECG149</td>
<td>62.0</td>
<td>4.0</td>
<td>126.0</td>
<td>13</td>
</tr>
<tr>
<td>ECG150</td>
<td>82.0</td>
<td>3.0</td>
<td>200.0</td>
<td>10</td>
</tr>
<tr>
<td>ECG151</td>
<td>110.0</td>
<td>2.3</td>
<td>450.0</td>
<td>7.2</td>
</tr>
</tbody>
</table>

**LINE OF LINEAR INTEGRATED CIRCUITS AVAILABLE FOR THE HOBBYIST AND EXPERIMENTER**

Sylvania is now marketing a family of the latest in linear integrated circuits which feature many possible applications for a variety of electronic projects. The miniature package size and low power requirements ideally adapt them for use in construction of battery-powered portable equipment. A booklet which provides a complete description, schematic, electrical characteristics, and a number of applications is packaged with each integrated circuit. These integrated circuits are available from your nearest Sylvania Electronic Tube Distributor. A brief description and some of the applications for each circuit are provided here.

**ECG 370 AGC/Squelch Amplifier**

The ECG 370 is a direct-coupled monolithic amplifier which utilizes an external DC voltage to control gain. In addition to communication system squelch and AGC applications, the ECG 370 is useful as a constant-amplitude audio oscillator, linear low frequency modulator, single-
sideband automatic load control, and as a variable DC gain element in analog computation.

**ECG 371 RF/IF Amplifier**—The ECG 371 integrated circuit is a monolithic RF-IF amplifier capable of emitter-coupled or cascade operation from DC to 250 MHz. Other applications of the circuit are as mixer, oscillator, detector, and modulator.

**ECG 372 AM IF Strip**—The ECG 372 is a broadband AM receiver subsystem, including a high-gain amplifier, an active detector, and self-contained automatic gain control. It is intended for IF or TRF applications from 50 KHz to 2 MHz.

**ECG 703 RF/IF Amplifier, Oscillator, and Mixer**—The ECG 703 integrated circuit is intended for use as a limiting or nonlimiting amplifier, harmonic mixer, or oscillator useful to frequencies in excess of 100 MHz. Circuit applications include 10, 30, 100, and 200-MHz RF Amplifiers, 10.7-MHz FM IF amplifier, 10-MHz oscillator, color TV sound IF amplifier, and a 3.58-MHz injection-locked oscillator for color TV.

**ECG 716 Audio Amplifier**—The ECG 716 is an integrated circuit audio amplifier capable of delivering up to 250 mW of power to an 8-ohm speaker or headset. Voltage gain of X10, X20, X100, or X200 can be chosen by selection of the appropriate circuit terminals.
Measurement Of Color TV High Voltage

by

W. J. Sember

High Voltage - - Care and Caution

Color TV sets have one control which has not been seen for quite a while on monochrome TV. Various called the HV Adjust, Horizontal Adjust, or just plain HV, its function is to adjust the high voltage to the manufacturer's recommended values. This control should never be used to restore brightness to an aging picture tube. The recent publicity on X-radiation has brought to everyone's attention that color sets can produce measurable soft X-ray radiation; in fact, any time electrons are accelerated by a voltage exceeding 16 KV, it is possible to produce X-rays; and the higher the voltage, the greater the likelihood of X-rays being produced. Color sets leaving the factory are tested from the radiation standpoint to insure that the design meets radiation requirements so long as the manufacturer's recommended voltages are not exceeded. The easiest way for the serviceman to assure his customers that their sets have not degraded from the radiation standpoint is to make sure that the high voltage is still at the manufacturer's recommended setting.

Figure 1. HV Probe

Why A High Voltage Control?

Modern black and white sets do not have any means of adjusting the high voltage. If the screen was dark and a pulse was available at the top cap, you replaced the 1B3 and that usually cleared up the trouble without any further adjustments. However, these sets usually operated at an anode current of 100 to 200 µa and roughly 18 to 20 KV, and it did not matter much whether the high voltage "squatted" slightly at high beam currents, since this only resulted in a slight loss of brightness. The total power drain taken from the horizontal output stage by the high voltage amounted to only about four watts, and changes in this would not adversely affect scan or component life. It is possible, with this relatively low power drain, to design the flyback system to take into account normal production tolerances on components and still provide satisfactory performance.

On the other hand, the energy-absorbing shadow mask in a color picture tube dictates high beam currents and second anode voltages to produce satisfactory bright-
ness at the picture tube screen. The average 23-inch color picture tube operates at 25 KV and 1 milliampere of total anode current in the three guns; this is a total of 25 watts of power consumed in the high voltage. This power must come from the horizontal deflection stage, and to design a "stiff" system to support this amount of power would mean that the deflection system alone would have to be as large physically as most modern color sets. The color picture tube requires a relatively-constant high voltage to prevent purity, focus, and convergence problems, so the obvious answer is a regulator (see Sylvania News, December, 1967 and February, 1968: "Color TV—High Voltage Regulation," by L. J. Songer and C. Droppa) to keep the high voltage relatively constant with changes in beam currents and loading on the flyback. A regulator system entails more components (with their tolerances) than a black and white flyback system, and the least expensive way of handling these tolerances in production is the use of a high voltage control which can be factory adjusted to a specified value of high voltage.

Regulator, high voltage may increase with life, so it is safe to turn the high voltage control down if snapping and arcing indicate that the high voltage is excessively high, but the control should never be turned up unless a meter is available to set the voltage to the recommended value for the receiver. Excessively high voltage not only can produce X-rays, but it will almost certainly guarantee short life for the components in the horizontal deflection system, since most of these systems are very closely designed.

**Meter Required**

Although several high voltage probes are presently available on the market, it is possible to construct your own to use with a commercial meter which you may already have. Any meter having an internal resistance of 20 K ohms per volt or higher can be adapted to measure the high voltage of present-day color sets if enough resistance is added externally to take care of the excess voltage above the highest range designed into the meter. For example, if you have a 20 K ohm per volt meter with a 3 KV scale, this can be easily converted to a 30 KV full scale by the addition of 540 M ohms in an external probe.

The calculation for determining the required resistance is shown in the following example. Remembering that a 20 K ohm per volt meter needs a current of 50 µa for full scale deflection, use ohms law to determine the required resistance.

![Diagram of HV Probe](image)

**Table One**

<table>
<thead>
<tr>
<th>Meter Resistance (Ohms/Volt)</th>
<th>Full Scale (KV)</th>
<th>To (KV)</th>
<th>Probe Resistance (M Ohms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20,000</td>
<td>5</td>
<td>50</td>
<td>900</td>
</tr>
<tr>
<td>20,000</td>
<td>6</td>
<td>60</td>
<td>1080</td>
</tr>
<tr>
<td>50,000</td>
<td>3</td>
<td>30</td>
<td>1350</td>
</tr>
</tbody>
</table>
Get Organized!
With Sylvania’s New Inventory Control Book

The new Dealer Inventory Control Book will help you maintain an accurate, up-to-date, organized accounting of your quality Sylvania receiving tubes. All Sylvania tube types currently available are listed alpha-numerically with ample space provided for inserting any new types that are added during the year. To further assist you busy dealers, we have clearly indicated all the color types and fastest moving types with special markings. Each book contains a detailed inventory procedure explanation. These books provide a workable, easy-to-use method of inventory control—if you use them! ET-1856
Safeguarding Your Business
From Burglary and
Robbery Loss

Burglary: Any unlawful entry
to commit a felony or a theft
even though no force was used
to gain entrance.

Robbery: Taking anything of
value by force, violence or use
of fear.

Small stores are prime targets
for burglars and holdup men.
Seeking dark and easy-to-enter
stores, burglars usually operate at
night. Attracted by careless dis-
plays of cash, holdup men often
strike at opening or closing time
or when customer traffic is light.

Because you could be the next
victim, you should be aware of the
precautionary measures that are
available to lessen the possibility
of robbery or burglary.

Locks

Using the right kind of lock is
easily pick a lock with less than
5 pins. (There are few non-pin
tumbler locks that give high
security.)

Dead bolt locks should be used
since they cannot be opened by
sliding a piece of flexible material
between the door edge and door
jamb. When you use a double
cylinder dead lock, the door can-
not be opened without a key on
either side. This means that on
a glass door there is no handle for a
burglar to reach by merely break-
ing the glass.

Safeguarding entrance ways, es-
pecially the rear door, cannot be
over emphasized. Because many
burglars favor back doors, they
should be barred as well as locked.

Key control of course is
important. To keep keys from falling
into the hands of burglars, issue
as few keys as possible, keeping a
record of all keys issued. Don't
use a key chain with a tag carry-
ing the store's address.

Burglar Alarms

The silent central-station bur-
glary alarm system gives your store
the best protection. The reason:
it does not notify the burglar as
does a local alarm—such as a siren
or bell—outside the store. A silent
alarm alerts only the specialists
who know how to handle bur-
glaries.

In large cities, central alarm
systems are available on a rental
basis from private firms in this
business; in small cities, they are
often tied directly into police head-
quarters. Part of the cost for
installing a silent alarm system will
sometimes be defrayed by a reduc-
tion in your burglary insurance
premium.

Although a building-type local
alarm is cheaper and easier to
install, it too often only warns the
thief and is not considered by
specialists to be as effective as a
central stations alarm. Of course,
if no central alarm service system
is available, or such an alarm is
not economically feasible, then by
all means install a building alarm.

Your Safe

Insurance companies recognize
the E Safe as adequate for most
merchant risks. Most insurance
companies give a sizeable reduc-
tion in premiums for use of the
E Safe which, over the years, can
pay for the added cost. The safe
should always be bolted to the
building structure.

Other burglary preventing
measures are: good lighting—
indoor and outdoor. When a
store is lighted at night the risk of
burglary is greatly reduced. Leave
your cash register drawer empty
and open at night. A burglar is
more likely to break in when a
closed register is spotted. Heavy
metal window screens are a good
idea. They are relatively inexpen-
sive and may be stored during
business hours.

Following the precautions dis-
cussed here may prevent burglars
from making you their next victim.

Identify Yourself As An Expert In TV Servicing

This colorful dealer decal high-
lights you as an expert in color TV
servicing, and identifies you as the
person to contact for top quality
Sylvania color bright 85® picture
tubes.

It adheres firmly to any smooth
surface: windows, counters and
tucks ... no water required. When
placed on your window, the
14" x 83/4" double face sells your
services inside and out.

Made of weather and fade re-
sistant material, this decal will
last for years.

Order your supply today ...
ET-1921R—25c each.
Sylvania Motion/Clock Signs
Light Up The Profit Picture

This is actually a choice of four different signs. You can select a clock (A) or motion segment (B) with either of two copy panels (1 or 2). The reverse side of the signs (3) promotes Silver Screen 85® and color bright 85® picture tubes.

These 10⅞" x 37⅝" signs are sturdily constructed of long lasting polystyrene and durable aluminum. They are made in four bright colors: yellow, red, white and black to add a cheerful note to any repair shop.

Ideal for hanging in store window or over counter (hanging chain and a font of letters for your copy are provided with each unit at no extra charge).

ET-2944—$38.50

Outdoor Sign . . .
Outstanding Value!

New Receiving Tube Types From Sylvania

Type | Description
--- | ---
2BA2 | Filamentary half-wave diode intended for service as a focus rectifier in color TV. Used by GE and Admiral.
3CX3 | Compactron with rapid warmup heater cathode designed for use in color TV receivers as the high voltage rectifier. Used by GE.
4JC6A | Sharp-cutoff pentode designed for use in the intermediate frequency amplifier stages of TV receivers. Used by Magnavox and GE.
5GH8A | Sharp-cutoff pentode and a medium-mu triode used primarily for service as an oscillator in the horizontal deflection system of TV receivers. Used by RCA.
6EX6 | Beam power pentode designed for use as the horizontal deflection amplifier in TV receivers. Used by GE.
6EY6 | Beam power pentode designed for use as the vertical deflection amplifier in TV receivers. Used by GE.
6JC6A | Sharp-cutoff pentode designed for use in the intermediate frequency amplifier stages of TV receivers. Used by Zenith and RCA.

Silver Screen 85®

Type | TV Set Usage
--- | ---
12DEP4 | Motorola
12DFP4 | Magnavox
12DP4 | Sears-Silvertone
16DCP4A | RCA
22ZP4 | Zenith
23JHP4 | Emerson

Anyway you look at it, this outdoor dealer sign is an exceptional value. Big . . . Bright . . . Bold . . . it will lead new customers right to your door! In four brilliant colors, it measures 2½' high by 3½' long. The durable plexiglass facing and sturdy aluminum frame will stand up over years of outdoor use.

Three 36" high-intensity Sylvania lamps are included to assure you that your name will be up in lights for quite a while! ET-1954—$58.00.
Years Ago In Sylvania News: 1949

Ban On Auto TV

When the Connecticut state legislature meets in January, a representative will introduce a bill to prohibit the installation of a television receiver in either an automobile or a locomotive. The bill will provide a penalty of a $1000 fine for offenders.

(Now, that's no laugh-in!)

INFORMATION FOR SYLVANIA TUBE TESTER OWNERS

Coletronics Service, Inc., 1744 Rockaway Avenue, Hewlett, Long Island, New York, is a source for tube data and adapters for Sylvania tube testers. Data is now available for models 139/140, 219/220 and 620.

For information concerning your particular model tube tester, fill out the convenient card and mail it to Coletronics.

Coletronics Service, Inc.
1744 Rockaway Avenue
Hewlett, Long Island, New York 11557

Please send me information regarding my Model No. Tube Tester

NAME

ADDRESS

CITY STATE ZIP CODE

ORDER COUPON

Order any item from your Sylvania distributor or mail this order form to:
Sylvania Electric Products Inc., 1100 Main Street, Buffalo, New York 14209

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Description</th>
<th>Price (each)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>ET-1856</td>
<td>Inventory Control Book</td>
<td>$0.50</td>
<td></td>
</tr>
<tr>
<td>ET-1954</td>
<td>Outdoor Sign</td>
<td>$58.00</td>
<td></td>
</tr>
<tr>
<td>ET-1921R</td>
<td>Dealer Decal</td>
<td>$0.25</td>
<td></td>
</tr>
<tr>
<td>ET-2944</td>
<td>Motion/Clock Sign</td>
<td>$38.50</td>
<td></td>
</tr>
</tbody>
</table>

(Circle One Letter and One Number—A B - 1 2)

Include Applicable Tax  

Grand Total  

NAME

STREET ADDRESS

CITY, STATE and ZIP

(Please Print)
The numbers can be adjusted to accommodate other meters; some samples are tabulated in Table 1. The resistance values seem quite large, but so are the voltages you are dealing with.

Construction of The Probe

The probe shown in Figures 1 and 2 was constructed using the last figures in the table for use with a 50 K ohm per volt (20 µa) meter with a full scale deflection of 3 KV. A piece of 3/8-inch I.D. phenolic tubing was used for the probe body. Any common plastic which does not absorb moisture, such as Bakelite, Lucite, or Nylon, may be used for the pieces at the ends of the probe. The circular shield for the handle was made from a piece of plexiglass 2 3/4 inches in diameter, but this dimension is not critical. The pieces at the ends of the probe were cut from 3/4-inch diameter rod. Drill and tap the nose piece to receive the No. 6-32 screw which is used for the tip of the probe. Turn down the end to fit into the phenolic tube body. Similarly, the butt cap is drilled for the HV lead and the end turned down to fit into the rear end of the tube body. The tip is made from a No. 6-32 screw which is something less than 3/16-inches long after the head is cut off and the tip is filed to a point. This dimension is not critical, but make sure the tip is long enough to fit under the high voltage button. Be sure to remove all threads over the exposed area of the tip. The handle may be of any substance of good dielectric quality, such as phenolic tubing. For convenience, plastic parts may be glued together; use cement sparingly.

Figure 2 shows a cross-sectional view of the probe which depicts the special high voltage resistor which is necessary to obtain high resistance in a relatively short space. The standard carbon resistor has only a 600 to 1000-volt rating, so it would take a fairly long string of high value resistors to accommodate the 25 KV of the modern color set. The special resistors used for this probe are ceramic tubing with resistance material applied in screw-thread fashion around the outside. Connection to the resistor is made via standard No. 6-32 threaded holes in the ends, and it is possible to "stack" resistance to obtain exact values. The resistor shown here is made by Resistance Products Corporation, Harrisburg, Penna., Part No. BP-6; they are available in values from 40 K ohms to 50 M ohms, ±2% rated at 30 KV. These resistors are handled through larger distributors at reasonable cost. The exact length of the probe will depend on the value of resistance used, so check this before starting construction of the probe.

One caution is extremely important when working with these high value resistors; Do Not allow bare hands to come into contact with the outside surface of the resistor. A sweaty hand can turn a 1000-M ohm resistor into 500 M ohms in a hurry, so if it is necessary to handle the resistor, use a clean, dry cloth between the hands and the resistor. Also, when soldering the wire lead to the solder lug at the low side of the probe, use excess solder on joints to keep sharp points from forming. Sharp points at these voltages can cause corona discharge and subsequent loss of high voltage. Make sure that this lead is insulated for the voltage which it will have to carry, i.e., if the 3 KV scale of the meter is being used, the lead will have to be insulated for at least 3 KV. Incidentally, if it is necessary to "trim" the value of resistance to exactly match your particular meter, conventional carbon resistors may be added to the low side of the probe for exact accuracy. Calibration should be checked against a meter of known accuracy.

Tips For Metering High Voltage

When using any high voltage metering device, it is wise to remember that you should use extreme caution. Remember to connect the ground lead first; if you don't, the lower end of the probe and the ground lead will have 25 KV on them after the probe contacts the high voltage, and the ground lead especially isn't insulated for this voltage.

Make sure the probe actually makes contact with the bare wire under the high voltage button. Many of the newer receivers have an oversize rubber suction cup covering the connection; considerable force is necessary to push the probe to the bare wire, but take care not to scratch the glass of the picture tube.

If you don't actually touch the wire, the meter will still read, but inaccurately, due to the electrostatic field near the wire.

This same electrostatic field around the bell of the picture tube can cause false meter readings if it is close enough to actually affect the meter movement itself. So, unless the meter is specially shielded to be used near a strong electrostatic field, keep it away from the bell of the picture tube, the yoke, and the horizontal section, where strong fields are present.

The values of high voltage recommended by the set manufacturers are given for a dark screen condition. The easiest way to obtain this when you are behind the set is to flip the service switch. However, if the set doesn't have a service switch, it will be necessary to turn down the brightness to give a "barely visible" picture before setting the high voltage.

Finally, but by far the most important, keep your body away from grounds when using any probe to read the high voltage. The electrostatic field near the picture tube will induce a charge on the insulated parts of the probe and on your arm, similar to the charge that can build up on a hard rubber rod when it is rubbed by cat's fur. If you touch a ground, this will discharge, and while you will not get a severe shock, it could startle you into dropping the probe or meter.

It cannot be stressed too strongly, when you are making measurements or adjustments in the high voltage circuits of a color TV set, that you should treat the job with the care and respect it deserves.
NEW 12DMP4 MONOCHROME TV
CHECK TUBE AVAILABLE

The 12DMP4 is the latest addition to the line of receiver check tubes innovated by Sylvania as industry firsts—the 5AXP4, 8XP4, and 8YP4. Type 12DMP4 receiver check tube is a valuable aid in servicing monochrome television receivers. Substitution of 12DMP4 for the picture tube of an inoperative receiver will usually indicate at once whether the picture tube or the chassis is at fault. Access to chassis components of very compact receivers can be improved by substitution of type 12DMP4 for a larger picture tube. Use of the check tube can often save removal and re-mounting of a large picture tube in the receiver cabinet.

Type 12DMP4 is a 110° deflection picture tube with 1½" diameter neck, B7-208 base, and 8HR basing. An adapter is supplied with the tube for operating it in B6-185 or B6-214 sockets wired for 7FA basing. Electrically, 12DMP4 has a 6.3 volt/600 ma heater and is designed for operation with 200 to 500 volts dc on Grid No. 2 and 10 to 22KV dc on anode. Best focus is obtained within the range −200 volts to +200 volts dc on Grid No. 4. This type has no external conductive coating on the bulb, but the metal tension band around the tube and the conductive anode coating inside, form a capacitor of approximately 150 pf.

As a receiver check tube, 12DMP4 can be substituted for almost any 110° or 114° picture tube, regardless of size or type of implosion protection. Just slip the neck of the 12DMP4 into the deflection yoke, attach the high voltage lead and the socket (using the adapter where necessary), and the tube is ready to operate. Type 12DMP4 operates without an ion trap magnet.

Type 12DMP4 will work but is not recommended as a substitute for 50°, 70°, or 90° deflection types. With a proper base adapter, it will operate, but it may not produce a usable raster. The 8XP4 receiver check tube is recommended for servicing receivers using tubes with deflection angles less than 110°, and having 1½" diameter necks.

While 12DMP4 gives its best picture at rated operating conditions, it can be used in any 500 ma or 450 ma heater string. (Cathode temperature and consequently screen brightness, will be lower in 450 ma strings). It will operate at any anode voltage and at any Grid No. 2 voltage above about 100 volts. Operation in a chassis providing 30 to 50 volts on Grid No. 2 will not harm the tube, but may produce a picture too dim to be useful. It will check operation of the focus voltage (Grid No. 4) supply, but since the tube is not sensitive to focus voltage change, several hundred volts variation may produce only a small change in appearance of the picture or pattern displayed. The receiver picture tube may not be in best focus at the same voltage as the check tube. Final receiver adjustments should always be made with the regular picture tube operating in the receiver.
ANTENNA PERFORMANCE
Key to Good Color Reception

A National Pastime

Virtually no one in this day and age goes about discussing the reception quality of his telephone. The telephone works, so he takes it for granted. Yet every day millions of people discuss their television reception. "How's your picture?" is a nationally discussed question. Obviously, the person who inquires is seeking to compare his "picture" with that of someone else's. He is doing this because in his mind he is doubtful about the quality of his own reception. He has good reason to be doubtful, for he and millions of others are the victims of sub-standard reception. This is especially true of color. "My color set is no good," is the usual explanation advanced by the householder to explain away a poor picture, and he believes it.

Ingredients of a Good Color Picture

Let's examine the facts. The vast majority of popular color receivers manufactured today are perfectly capable of delivering high-quality color pictures. To prove this, a visit to any of the plants where the sets are made will afford you an opportunity to see thousands of color receivers "lit up like Christmas trees" as they come through final test. How then is it possible that these sets give good color results at the factory and yet perform poorly in the living room? The answer is simple: at the factory they are being fed with the proper color signal, and in the home of the user, they are not. There is no mystery or magic involved in good color reception. Whatever the presence of a well functioning color receiver, you need only these three additional ingredients: a reasonable level of interference-free signal, a well designed color antenna, and a proper transmission line. Put them all together and you have excellent color every time. Leave one out, and there goes the color picture!

The level of available signal at the receiving site is usually beyond your control. However, the choice of which antenna to use is far more broad. Everyone and his brother has some sort of antenna that they are pushing. In far too many cases the decision is made to use the cheapest and most readily available color antenna on the theory that "what's the difference—all antennas are pretty much the same." This simply is not true, and if the installer wishes to avoid customer complaints about picture quality, he should not make this assumption. Many of the antennas on the market today are poorly suited to the task of providing quality color reception consistently over a long period of time.

The "Lens" of The Color Receiver

What then is a good color antenna? It is, simply stated, a device which has been designed to process each television channel individually in the most linear possible fashion and for the longest possible time. Does this mean that antenna gain is no longer important? No, the forward gain of the antenna is just as important for color as it is for black and white TV. However, since the black and white transmission utilizes only a segment of the bandwidth for each six-MHz television channel, abrupt variations in gain across a channel and from channel to channel could be tolerated.

On the other hand, color transmission utilizes a considerable portion of each six-MHz television channel, and its proper reception dictates that the color antenna present a relatively flat and linear response to the entire transmission of each channel to permit all of the transmission to reach the receiver. Failure of the antenna to do this causes the antenna to act effectively as a filter, which distorts much of the color information before it ever reaches the receiver. Further, to minimize color smear and other forms of distortion, the antenna should respond relatively little to unwanted signals. Thus, it may truly be said that the color (Continued on Last Page)
Ten Requirements of Good Color Antennas

1. The antenna must have sufficient gain for the area in which it is installed. This is sizing the antenna for the particular location where it will be used. By sizing we mean selecting an antenna of such gain that the TV set will be provided with enough signal to properly drive it. Suitable signal strength would range from 200 µV to 2000 µV. The Sylvania broad line of color antennas provides a model for every location (Figure 1), from the near-suburban to the deep fringe areas.

   The antennas provide more gain as frequency increases. This compensates for the propagation and feed line losses which increase with frequency. Figure 1 indicates the trend of the Sylvania line of antennas to show increasing gain with increasing frequency. The gains shown correspond to antenna response at mid-low VHF band (channel 4), FM (88 MHz), mid-high VHF band (channel 10), and mid-UHF band (channel 50).

2. Ideally, antenna response should be essentially linear across the six-MHz band of each channel. This assures that all of the transmitted video, color, and audio information is faithfully introduced to the transmission line. Wide variations in gain across a channel can destroy picture fidelity, particularly in a low-signal area. For example, a droop in antenna gain towards the high end of a channel (Figure 2A) will result in loss of color performance. Sylvania antennas are designed for a gain performance of ± one dB across each channel (Figure 2B).

3. The antenna should be directional, that is, signals appearing at the sides and rear should be largely cancelled or suppressed. These unwanted signals, if not greatly attenuated relative to the forward gain of the antenna, commonly appear in the set as ghosts, reflections, co-channel interference, and noise. Any of these can play havoc with a color picture. Any of these can play havoc with a color picture. Figure 3 indicates the excellent front-to-back ratio of one antenna of the Sylvania line. At the two typical frequencies (channels 11 and 47) shown, the rear 180-degree response of the antenna is less than 10 per cent of the forward pickup. Notice the freedom of large, interference-producing side lobes.

4. To cover all present TV channels allocated by the FCC, the antenna must be receptive to VHF (54 to 88 MHz and 174 to 216 MHz) and UHF (470 to 890 MHz). It is also highly desirable for the antenna to include FM (88 to 108 MHz). All antennas of the Sylvania broad line were specifically designed to cover both the VHF and FM bands. For areas in which UHF is present, Sylvania provides antenna models which cover all bands (VHF, FM, and UHF).

5. Output impedance of the antenna should be matched to transmission line. Mismatch between antenna and lead wire can cause color smear and cut down on efficiency of the antenna. It is vital that a well matched transmission line be used. Basically, there are two impedances used in home receiving antennas: 300 ohm, and 75 ohm. A 75-ohm antenna is often effectively used in high noise areas and feeds directly into 75-ohm co-axial cable which provides complete shielding. The Sylvania broad line of color antennas is available in both 75 and 300-ohm impedances.

6. An antenna that has all of the previous electrical performance characteristics is of little value unless electrical integrity of all elements to feed lines is maintained over a long period of time. The antenna is an electrical circuit; therefore, if an element loses contact with the feed line, a part of the circuit is lost. Obviously, when this happens the antenna no longer functions as designed. Wind, rain, ice, and other environmental conditions combine to make this requirement a formidable task for the antenna designer to achieve.

   Sylvania achieves this electrical integrity in its antennas through use of the double boom design, in which the booms themselves are the transmission lines. The rectangular boom provides a large, flat surface for solid mechanical and electrical contact with the positive-lock snap joints (Figure 4), which retain the driven elements. Carefully-formed shoulders on the snap joints assure long-lived electrical contact with the elements. This design makes the elements, effectively, electrically integral with the double boom transmission line.
7. The antenna must be strong enough to withstand the strong winds and other climatic influences encountered in its rooftop environment. Mechanical design is a primary consideration in meeting this requirement. Features of the Sylvania antenna design in this respect are:

- Double boom construction—much stronger than a single boom design (Figure 5). Booms connected and reinforced by sturdy bridge cross ties.
- One-half inch, seamless elements—a Sylvania exclusive. Being physically stronger, the elements hold their alignment much longer. The greater surface area provides a high Q. The absence of seams means better radial symmetry throughout the length of the element—all factors which provide a more efficient electrical element.
- No braces required from boom to mast—permits mounting an antenna rotor directly beneath the antenna. Rotor life is increased through elimination of a long mast extension.
- End caps on ends of booms—prevent corrosion-causing water traps.

8. As an additional requirement for long antenna life, booms and elements should be built of high quality aluminum tubing. Skimping here again means short antenna life. All Sylvania antennas incorporate rectangular cross-section, seamless booms of structural grade 3005-H-29 aluminum with 1-inch by 1-inch by 0.041-inch walls (Figure 6). Elements are half-inch seamless aluminum with 0.0165-inch walls. High-strength, injection molded plastic is used for all non-metal parts. Rivets, U-bolts, and all other hardware are of heavy-duty, industrial grade.

9. The antenna should be protectively coated to resist the effects of salt and other corrosive atmosphere. This coating should be applied to inner and outer surfaces. All aluminum parts of Sylvania antennas are processed through a seven-bath, weather-resisting alodine solution prior to assembly. This assures that all surfaces are completely covered. The high-conductivity coating penetrates the metal surface to a nominal depth of two-mils (Figure 6).

10. The antenna must be easy to install. There should be a minimum of loose parts and subassemblies in the box, and installation instructions should be clear. To ease the installer's job, Sylvania has incorporated these features into its broad line of color antennas:

- Quick, set-up snap joints lock the elements into place in minutes.
- Major parts are preassembled.
- All hardware is in place.

Figure 5—Overall Rugged Construction; Parts of High Quality Aluminum and Plastic
Figure 6—Full Alodine Protection of All Aluminum Internal and External Surfaces
antenna is the “lens” of the color receiver. Obviously, no one should use a poorly designed color antenna as the “lens” for a color set and expect optimum performance.

**The Rugged Elements**

Therefore, to develop the Sylvania line of color antennas, we were faced with the problem of designing a set of broadband, high-gain, directional, and effectively linear devices. But that’s just the beginning. As a primary goal, our antennas would have to continue delivering their designed performance for three years, four years, and longer. While we were at it, we took particular care to include the FM spectrum as well. As a necessary measure to meet these goals, these antennas would be fabricated from materials substantially superior to those in general use today by other rooftop antenna makers. Mechanical design would also be of primary importance. We did this not only to achieve a superior mechanical product, but particularly to insure the electrical integrity of the antenna, including both relative parts alignment and continuity, for the longest possible time. Remember, an antenna is truly an electrical circuit. The longer each of the antenna parts resists the elements and corrosion, the longer the antenna will permit the receiver to deliver good color pictures. Simply stated, fine electrical design means little if the mechanical design is flimsy. The instant an element is bent out of alignment or snapped off — there goes electrical performance!

As an example of this, when our field experience clearly indicated the need for an antenna which could cope with the high incidence of salt and toxic corrosion so prevalent in many residential areas of the nation, salt corrosion tests were conducted. The results not only indicated a need for a completely aluminum antenna, but also one on which all surfaces of all parts, both inside and out, were treated with the immersion alodine process before assembly. This same process is now carried out with every Sylvania production antenna.

**The Cost Factor and Long Life**

For some reason many service and installation men are reluctant to sell quality antenna installations, perhaps in the mistaken notion that the customer has “shot his roll” when he purchased his color receiver. To the average household, the entire matter of obtaining a color picture in his living room is indeed a mystery. Bluntly, he doesn’t know what he needs, and it’s up to the service man to intelligently tell him.

Your customer wants good color pictures. This is why he is constantly comparing his result with others. He is also willing to pay to get it, as evidenced by the thousands of householders who subscribe to community antenna systems to obtain better pictures. It logically follows that informed customers are also willing to pay for quality antenna installations—**they are less expensive in the long run.**

An antenna’s initial performance is one thing—but what happens to performance after the antenna has been on the end of a mast for a year or two? The key to all of this is durability—durability through the materials used, through mechanical design, and through construction details.

The centerfold of this article examines these and other performance criteria in detail, and the degree to which the Sylvania line of color antennas meets them.

**ERRATUM**

The February issue incorrectly stated the values for a range of resistors available from the manufacturer in the article on color TV high voltage measurement. Instead of 40K ohms to 50M ohms, the resistors are available in values from 40K ohms to 50G (giga) ohms.