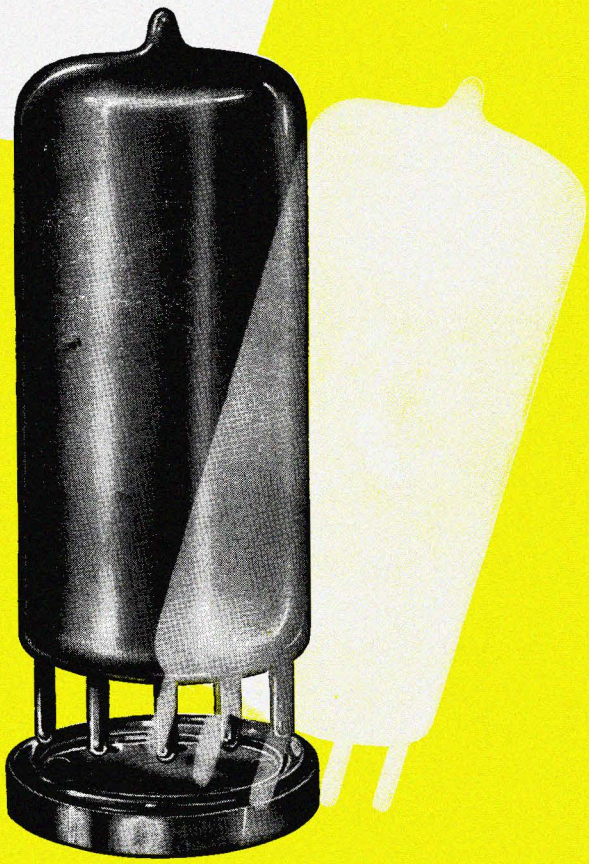
# SYLVANIA TUBE SUBSTITUTION MANUAL



- quick references for substitutions of critical radio and television tubes

SYLVANIA ELECTRIC
PRODUCTS INC., EMPORIUM, PENNA.

# SYLVANIA TUBE SUBSTITUTION MANUAL

Quick references for substitutions of
critical Radio and Television Tubes

A Technical Publication of

SYLVANIA ELECTRIC PRODUCTS INC.

EMPORIUM, PENNA.

# SYLVANIA TUBE SUBSTITUTION MANUAL

TABLE OF CONTENTS





Tenth Printing -- January 1953



SYLVANIA ELECTRIC PRODUCTS INC.
EMPORIUM, PENNA.

# GENERAL TUBE CLASSIFICATIONS

The following classified listing has been prepared to assist service technicians and engineers in selecting substitutions for types not listed in the charts or when a major change in power supply is undertaken.

The characteristics selected for listing do not mean that the others are not important. The intention is to enable the user to select a group of possible tubes and then eliminate those which for other reasons may be undesirable.

The classifications into which the types have been grouped are those which our experience has found most useful. Television, of course, being so new, has required the addition of two groups of scanning tubes and the high voltage rectifiers. Other television tube functions have been included with the corresponding radio receiving types. One exception is the television converter tube which being usually a high frequency duo-triode is listed with the H.F. triodes.

As an example of its use let us consider the selection of an F.M. diode triode to replace Type 7K7. The first thing to note is that 7K7 has the diode cathodes separate from the triode cathode. This limits the selection immediately and brings up the possibility of using separate diodes, either in a tube, using a miniature if there are space limitations, or germanium crystals. To find the nearly direct replacements run down the column for amplification constant in the diode triodes; since the 7K7 has a mu of 70, select those having a value between 50 and 100 and having 6.3 volt heaters. There are 20 of these, but a quick check of the basing diagrams in the Sylvania Receiving Tubes Characteristics Chart eliminates all but 6S8GT and 6T8 (Type 7X7 has one separate diode and one on the triode cathode.) If none of these are available the separate diode alternatives must be considered. If that is the case all 20 of the selected types in the diode triode table as well as the high mu types in the general purpose triodes can be tried.

**AMPLIFIERS (REMOTE CUT-OFF R-F)**
**Pentodes — Tetrodes**

| Type | Ef | If | Style | Gm |
|---|---|---|---|---|
| 1A4P | 2.0 | 0.06 | ST-12 | 625<br>725 |
| 1A4T | 2.0 | 0.06 | ST-12 | 625<br>650 |
| 1AB5 | 1.2 | 0.13 | Lock-in | 1100<br>1350 |
| 1D5GP | 2.0 | 0.06 | ST-12 | 625<br>725 |
| 1D5GT | 2.0 | 0.06 | ST-12 | 625<br>650 |
| 1P5GT | 1.4 | 0.05 | GT | 750 |
| 1SA6GT | 1.4 | 0.05 | GT | 750<br>950<br>970 |
| 1T4 | 1.4 | 0.05 | Min. | 700<br>900 |
| 6AB7 | 6.3 | 0.45 | Metal | 3500 |
| 6BA6 | 6.3 | 0.30 | Min. | 4300<br>4400 |
| 6BD6 | 6.3 | 0.30 | Min. | 2000<br>2350 |
| 6BJ6 | 6.3 | 0.15 | Min. | 3600<br>3650 |
| 6D6 | 6.3 | 0.30 | ST-12 | 1500<br>1600 |
| 6E7 | 6.3 | 0.30 | ST-12 | 1500<br>1600 |
| 6K7/G | 6.3 | 0.30 | Metal/ST-12 | 1650<br>1450 |
| 6K7GT | 6.3 | 0.30 | GT | 1650<br>1450 |
| 6R6G | 6.3 | 0.3 | ST-12 | 1160 |
| 6S7/G | 6.3 | 0.15 | Metal/ST-12 | 1250<br>1750 |
| 6SD7GT* | 6.3 | 0.30 | GT | 3350<br>3600 |
| 6SG7* | 6.3 | 0.30 | Metal | 4100<br>4700<br>4000 |
| 6SG7GT* | 6.3 | 0.30 | GT | 4100<br>4700<br>4000 |
| 6SK7/GT | 6.3 | 0.30 | Metal/GT | 2350<br>2000 |
| 6SS7 | 6.3 | 0.15 | Metal | 1950<br>1850 |
| 6U7G | 6.3 | 0.30 | ST-12 | 1500<br>1600 |
| 7A7 | 6.3 | 0.30 | Lock-in | 2350<br>2000 |
| 7AH7 | 6.3 | 0.15 | Lock-in | 3300 |
| 7B7 | 6.3 | 0.15 | Lock-in | 1675<br>1750 |
| 7H7 | 6.3 | 0.30 | Lock-in | 4000 |
| 7T7 | 6.3 | 0.3 | Lock-in | 4900<br>4000 |
| 12BA6 | 12.6 | 0.15 | Min. | 4300<br>4400 |
| 12BD6 | 12.6 | 0.15 | Min. | 2000<br>2350 |
| 12K7GT | 12.6 | 0.15 | GT | 2350<br>2000 |
| 12SG7 | 12.6 | 0.15 | Metal | 4100<br>4700<br>4000 |
| 12SK7/GT | 12.6 | 0.15 | Metal/GT | 2300<br>2000 |
| 14A7 | 12.6 | 0.15 | Lock-in | 2350<br>2000 |
| 14H7 | 12.6 | 0.15 | Lock-in | 4000 |
| 26A6 | 26.5 | 0.07 | Min. | 2000<br>4000 |
| 34.. | 2.0 | 0.06 | ST-14 | 560<br>600<br>620 |
| 35/51 | 2.5 | 1.75 | ST-14 | 1020<br>1050 |
| 35S/51S | 2.5 | 1.75 | ST-14 | 1020<br>1050 |
| 39/44 | 6.3 | 0.30 | ST-12 | 960<br>1000<br>1050 |
| 58/58S | 2.5 | 1.0 | ST-12 | 1500<br>1600 |
| 58AS | 6.3 | 0.40 | ST-12 | 1500<br>1600 |
| 78 | 6.3 | 0.30 | ST-12 | 1275<br>1100<br>1450 |
| 5590* | 6.3 | 0.15 | Min. | 2000 |
| 5725 | 6.3 | 0.175 | Min. | |
| 9001* | 6.3 | 0.15 | Min. | 1400 |

*Semi-remote

**AMPLIFIERS (SHARP CUT-OFF RF)**
**Pentodes — Tetrodes**

| Type | Ef | If | Style | Gm |
|---|---|---|---|---|
| 1AE4 | 1.25 | 0.10 | Min. | 1550 |
| 1AF4 | 1.4 | 0.025 | Min. | 825<br>950 |
| 1B4P | 2.0 | 0.06 | ST-12 | 560<br>650 |
| 1E5GP | 2.0 | 0.06 | ST-12 | 560<br>650 |
| 1L4 | 1.4 | 0.05 | Min. | 925<br>1025 |
| 1LC5 | 1.4 | 0.05 | Lock-in | 750<br>775 |
| 1LG5 | 1.4 | 0.05 | Lock-in | 800<br>800<br>1050 |
| 1LN5 | 1.4 | 0.05 | Lock-in | 800 |
| 1N5GT | 1.4 | 0.05 | GT | 750 |
| 1U4 | 1.4 | 0.05 | Min. | 900 |
| 3E6 | 1.4<br>2.8 | 0.10<br>0.05 | Lock-in | 2100<br>1800 |
| 6AC7 | 6.3 | 0.45 | Metal | 6750 |
| 6AG5 | 6.3 | 0.30 | Min. | 4750<br>5100<br>5000 |
| 6AH6 | 6.3 | 0.45 | Min. | 9000 |
| 6AJ5 | 6.3 | 0.175 | Min. | 2750 |
| 6AK5 | 6.3 | 0.175 | Min. | 5000<br>4300<br>5100 |
| 6AM6 | 6.3 | 0.30 | Min. | 7500 |
| 6AS6 | 6.3 | 0.175 | Min. | 3500 |
| 6AU6 | 6.3 | 0.30 | Min. | 3900<br>4450<br>5200 |
| 6BC5 | 6.3 | 0.30 | Min. | 4900<br>6100<br>5700 |
| 6BH6 | 6.3 | 0.15 | Min. | 3400<br>4600 |
| 6C6 | 6.3 | 0.30 | ST-12 | 1185<br>1225 |
| 6CB6 | 6.3 | 0.30 | Min. | 6200 |
| 6D7 | 6.3 | 0.30 | ST-12 | 1185<br>1225 |
| 6J7 | 6.3 | 0.30 | Metal | 1225 |
| 6J7G | 6.3 | 0.30 | ST-12 | 1225 |

Amplifiers (Sharp cut-off RF) Cont'd

| Type | Ef | If | Style | Gm |
|---|---|---|---|---|
| 6J7GT | 6.3 | 0.30 | GT | 1225 |
| 6SE7GT | 6.3 | 0.30 | GT | 3100 |
| | | | | 3400 |
| 6SH7 | 6.3 | 0.30 | Metal | 4000 |
| | | | | 4900 |
| 6SH7GT | 6.3 | 0.30 | GT | 4000 |
| | | | | 4900 |
| 6SJ7/GT | 6.3 | 0.30 | Metal/GT | 1575 |
| | | | | 1650 |
| 6W7G | 6.3 | 0.15 | ST-12 | 1225 |
| 7AB7 | 6.3 | 0.15 | Lock-in | 1800 |
| 7AD7 | 6.3 | 0.60 | Lock-in | 9500 |
| 7AG7 | 6.3 | 0.15 | Lock-in | 4200 |
| 7AJ7 | 6.3 | 0.3 | Lock-in | 2275 |
| | | | | 1575 |
| 7AK7 | 6.3 | 0.8 | Lock-in | 6500 |
| 7C7 | 6.3 | 0.15 | Lock-in | 1225 |
| | | | | 1300 |
| 7G7 | 6.3 | 0.45 | Lock-in | 4500 |
| 7L7 | 6.3 | 0.30 | Lock-in | 3000 |
| | | | | 3100 |
| 7V7 | 6.3 | 0.45 | Lock-in | 5800 |
| 7W7 | 6.3 | 0.45 | Lock-in | 5800 |
| 12AU6 | 12.6 | 0.15 | Min. | 3900 |
| | | | | 4450 |
| | | | | 5200 |
| 12AW6 | 12.6 | 0.15 | Min. | 5000 |
| | | | | 5100 |
| | | | | 4750 |
| 12J7GT | 12.6 | 0.15 | GT | 1225 |
| 12SH7/GT | 12.6 | 0.15 | Metal/GT | 4000 |
| | | | | 4900 |
| 12SJ7 | 12.6 | 0.15 | Metal | 1575 |
| | | | | 1650 |
| 12SJ7GT | 12.6 | 0.15 | GT | 1575 |
| | | | | 1650 |
| 14C7 | 12.6 | 0.15 | Lock-in | 2275 |
| | | | | 1575 |
| 14W7 | 12.6 | 0.225 | Lock-in | 5800 |
| 15 | 2.0 | 0.22 | ST-12 | 710 |
| | | | | 750 |
| 22 | 3.3 | 0.132 | ST-14 | 125 |
| 24A/24S | 2.5 | 1.75 | ST-14 | 1000 |
| | | | | 1050 |
| 32 | 2.0 | 0.06 | ST-14 | 640 |
| | | | | 650 |
| 36 | 6.3 | 0.30 | ST-12 | 1000 |
| | | | | 1050 |
| | | | | 1080 |
| EF50 | 6.3 | 0.30 | Metal/Glass | 6300 |
| 57/57S | 2.5 | 1.0 | ST-12 | 1185 |
| | | | | 1225 |
| 57AS | 6.3 | 0.40 | ST-12 | 1185 |
| | | | | 1225 |
| 77 | 6.3 | 0.30 | ST-12 | 1100 |
| | | | | 1250 |
| 1221 | 6.3 | 0.30 | ST-12 | 1185 |
| | | | | 1225 |
| 1223 | 6.3 | 0.30 | ST-12 | 1185 |
| | | | | 1225 |
| 1229 | 2.0 | 0.06 | ST-12 | Spec. Type 32 |
| 1231 | 6.3 | 0.45 | Lock-in | 5500 |
| | | | | 6500 |
| 1273 | 6.3 | 0.30 | Lock-in | 2275 |
| | | | | 1575 |
| 1280 | 12.6 | 0.15 | Lock-in | 2275 |
| | | | | 1575 |
| 5591 | 6.3 | 0.15 | Min. | 5000 |
| | | | | 4300 |
| | | | | 5100 |
| 5654 | 6.3 | 0.175 | Min. | 5000 |
| 5693 | 6.3 | 0.3 | Metal | 1650 |
| 5847 | 6.3 | 0.3 | T-6½ | 12500 |
| 5879 | 6.3 | 0.15 | T-6½ | 1000 |
| 5901 | 1.4 | 0.05 | Min. | 900 |
| 9003 | 6.3 | 0.15 | Min. | 1800 |

CONVERTERS

| Type | Ef | If | Style | Gc |
|---|---|---|---|---|
| 1A6 | 2.0 | 0.06 | ST-12 | 275 |
| | | | | 300 |
| 1A7GT | 1.4 | 0.05 | GT | 250 |
| 1B7GT | 1.4 | 0.10 | GT | 350 |
| 1C6 | 2.0 | 0.12 | ST-12 | 300 |
| | | | | 325 |
| 1C7G | 2.0 | 0.12 | ST-12 | 300 |
| | | | | 325 |
| 1C8 | 1.25 | 0.04 | T-3 | 100 |
| 1D7G | 2.0 | 0.06 | ST-12 | 275 |
| | | | | 300 |
| 1L6 | 1.4 | 0.05 | Min. | 300 |
| 1LA6 | 1.4 | 0.05 | Lock-in | 250 |
| 1LB6 | 1.4 | 0.05 | Lock-in | 100 |
| 1LC6 | 1.4 | 0.05 | Lock-in | 250 |
| | | | | 275 |
| 1R5 | 1.4 | 0.05 | Min. | 235 |
| | | | | 300 |
| 1U6 | 1.4 | 0.025 | Min. | 260 |
| | | | | 275 |
| 2A7/2A7S | 2.5 | 0.80 | ST-12 | 360 |
| | | | | 550 |
| 6A7/6A7S | 6.3 | 0.30 | ST-12 | 360 |
| | | | | 550 |
| 6A8 | 6.3 | 0.30 | Metal | 360 |
| | | | | 550 |
| 6A8G | 6.3 | 0.30 | ST-12 | 360 |
| | | | | 550 |
| 6A8GT | 6.3 | 0.30 | GT | 360 |
| | | | | 550 |
| 6AN7 | 6.3 | 0.23 | T-6½ | 750 |
| 6BA7 | 6.3 | 0.30 | T-6½ | 900 |
| | | | | 950 |
| 6BE6 | 6.3 | 0.30 | Min. | 455 |
| | | | | 475 |
| 6D8G | 6.3 | 0.15 | ST-12 | 325 |
| | | | | 550 |
| 6J8G | 6.3 | 0.30 | ST-12 | 290 |
| 6K8 | 6.3 | 0.30 | Metal | 350 |
| 6K8G/GT | 6.3 | 0.30 | ST-12/GT | 350 |
| 6L7 | 6.3 | 0.30 | Metal | 350* |
| 6L7G | 6.3 | 0.30 | ST-12 | 350* |
| 7A8 | 6.3 | 0.15 | Lock-in | 375 |
| | | | | 550 |
| 7B8 | 6.3 | 0.3 | Lock-in | 360 |
| | | | | 550 |
| 7J7 | 6.3 | 0.30 | Lock-in | 280 |
| | | | | 290 |
| 7Q7 | 6.3 | 0.30 | Lock-in | 525 |
| | | | | 550 |
| 7S7 | 6.3 | 0.30 | Lock-in | 500 |
| | | | | 525 |
| 12A8GT | 12.6 | 0.15 | GT | 360 |
| | | | | 550 |
| 12BA7 | 12.6 | 0.15 | T-6½ | 900 |
| | | | | 950 |
| 12BE6 | 12.6 | 0.15 | Min. | 455 |
| | | | | 475 |
| 12K8 | 12.6 | 0.15 | Metal | 350 |
| 12K8GT | 12.6 | 0.15 | GT | 350 |
| 12SA7 | 12.6 | 0.15 | Metal | 425 |
| | | | | 450 |
| 12SA7GT | 12.6 | 0.15 | GT | 425 |
| | | | | 450 |
| 12SY7 | 12.6 | 0.15 | Metal | 450 |
| 14B8 | 12.6 | 0.15 | Lock-in | 360 |
| | | | | 550 |
| 14J7 | 12.6 | 0.15 | Lock-in | 280 |
| | | | | 290 |
| 14Q7 | 12.6 | 0.15 | Lock-in | 525 |
| | | | | 550 |
| 14S7 | 12.6 | 0.15 | Lock-in | 500 |
| | | | | 525 |
| 26D6 | 26.5 | 0.07 | Min. | 270 |
| | | | | 455 |
| | | | | 475 |
| FM1000 | 6.3 | 0.30 | Lock-in | ... |
| 1612 | 6.3 | 0.30 | Metal | 350* |

*require separate oscillator

DIODE DETECTORS
Single and Double

| Type | Ef | If | Style | Output Current Ma/plate |
|---|---|---|---|---|
| 1A3 | 1.4 | 0.150 | Min. | 0.5 |
| 1R4 | 1.4 | 0.150 | Lock-in | 1.0 |
| 2S/4S | 2.5 | 1.35 | ST-12 | 40.0 |
| 6AL5 | 6.3 | 0.30 | Min. | 9.0 |
| 6AN6 | 6.3 | 0.20 | Min. | 8.0 |
| 6BC7 | 6.3 | 0.45 | T-6½ | 12.0 |
| 6H4GT | 6.3 | 0.15 | GT | 4.0 |
| 6H6/GT | 6.3 | 0.30 | Metal/GT | 8.0 |
| 7A6 | 6.3 | 0.15 | Lock-in | 8.0 |
| 7C4 | 6.3 | 0.15 | Lock-in | 5.0 |
| 12AL5 | 12.6 | 0.15 | Min. | 9.0 |
| 12H6 | 12.6 | 0.15 | Metal | 8.0 |
| 5679 | 6.3 | 0.15 | Lock-in | 8.0 |
| 5726 | 6.3 | 0.30 | Min. | 9.0 |
| 9006 | 6.3 | 0.15 | Min. | 5.0 |

DIODE-PENTODES

| Type | Ef | If | Style | Gm |
|---|---|---|---|---|
| 1AF5 | 1.4 | 0.025 | Min. | 500 |
| | | | | 600 |
| 1F6 | 2.0 | 0.06 | ST-12 | 650 |
| 1F7G | 2.0 | 0.06 | ST-12 | 650 |
| 1F7GV | 2.0 | 0.06 | ST-12 | 650 |
| 1LD5 | 1.4 | 0.05 | Lock-in | 550 |
| | | | | 575 |
| 1N6G | 1.4 | 0.05 | GT | 800 |
| 1S5 | 1.4 | 0.05 | Min. | 625 |
| 1SB6GT | 1.4 | 0.05 | GT | 665 |
| | | | | 500 |
| 1U5 | 1.4 | 0.05 | Min. | 625 |
| 2B7/2B7S | 2.5 | 0.80 | ST-12 | 950 |
| 6B8/G | 6.3 | 0.30 | Metal/ST-12 | 950 |
| 6B8GT | 6.3 | 0.30 | GT | 950 |
| 6N8 | 6.3 | 0.30 | T-6½ | 2200 |
| 6SF7 | 6.3 | 0.30 | Metal | 1975 |
| | | | | 2050 |
| 6SV7 | 6.3 | 0.30 | Metal | 3600 |
| 7E7 | 6.3 | 0.30 | Lock-in | 1600 |
| | | | | 1300 |
| 7R7 | 6.3 | 0.30 | Lock-in | 2100 |
| | | | | 3000 |
| 12C8 | 12.6 | 0.15 | Metal | 950 |
| 12SF7 | 12.6 | 0.15 | Metal | 1975 |
| | | | | 2050 |
| 14E7 | 12.6 | 0.15 | Lock-in | 1600 |
| | | | | 1300 |
| 14R7 | 12.6 | 0.15 | Lock-in | 2100 |
| | | | | 3000 |

DIODE TRIODES
(DETECTOR-AMPLIFIER)
Single Diode Triode
Duo Diode Triode
Triple Diode Triode

| Type | Ef | If | Style | μ |
|---|---|---|---|---|
| 1B5 | 2.0 | 0.06 | ST-12 | 20 |
| 1H4G | 2.0 | 0.06 | ST-12 | 9.3 |
| 1H5GT | 1.4 | 0.05 | GT | 65 |
| 1H6G | 2.0 | 0.06 | ST-12 | 20 |
| 1LH4 | 1.4 | 0.05 | Lock-in | 65 |
| 2A6 | 2.5 | 0.80 | ST-12 | 100 |
| 6AQ6 | 6.3 | 0.15 | Min. | 70 |
| 6AQ7GT | 6.3 | 0.30 | GT | 70 |
| 6AT6 | 6.3 | 0.30 | Min. | 70 |
| 6AV6 | 6.3 | 0.30 | Min. | 100 |
| 6AW7GT | 6.3 | 0.30 | GT | 80 |
| 6B6G | 6.3 | 0.30 | ST-12 | 100 |
| 6BD7 | 6.3 | 0.23 | T-6½ | 70 |
| 6BF6 | 6.3 | 0.30 | Min. | 16 |
| 6BK6 | 6.3 | 0.30 | Min. | 100 |
| 6BT6 | 6.3 | 0.30 | Min. | 70 |

Diode Triode (Continued)

| Type | Ef | If | Style | μ |
|---|---|---|---|---|
| 6BU6 | 6.3 | 0.30 | Min. | 16.5 |
| | | | | 16.0 |
| 6C7 | 6.3 | 0.30 | ST-12 | 20 |
| 6Q7 | 6.3 | 0.30 | Metal | 70 |
| 6Q7G | 6.3 | 0.30 | ST-12 | 70 |
| 6Q7GT | 6.3 | 0.30 | GT | 70 |
| 6R7 | 6.3 | 0.30 | Metal | 16 |
| 6R7GT | 6.3 | 0.30 | GT | 16 |
| 6R8 | 6.3 | 0.45 | T-6½ | 16 |
| 6S8GT | 6.3 | 0.30 | GT | 100 |
| 6SQ7GT | 6.3 | 0.30 | GT | 16 |
| 6SR7/GT | 6.3 | 0.30 | Metal/GT | 16 |
| 6ST7 | 6.3 | 0.15 | Metal | 16 |
| 6SZ7 | 6.3 | 0.15 | Metal | 70 |
| 6T7G | 6.3 | 0.15 | ST-12 | 65 |
| 6T8 | 6.3 | 0.45 | T-6½ | 70 |
| 6V7G | 6.3 | 0.30 | ST-12 | 8.3 |
| 7B6 | 6.3 | 0.30 | Lock-in | 100 |
| 7C6 | 6.3 | 0.15 | Lock-in | 85 |
| | | | | 100 |
| 7E6 | 6.3 | 0.30 | Lock-in | 16 |
| | | | | 16.5 |
| 7K7 | 6.3 | 0.30 | Lock-in | 70 |
| 7X7 | 6.3 | 0.30 | Lock-in | 85 |
| | | | | 100 |
| 12AT6 | 12.6 | 0.15 | Min. | 70 |
| 12AV6 | 12.6 | 0.15 | Min. | 100 |
| 12BF6 | 12.6 | 0.15 | Min. | 16 |
| 12BK6 | 12.6 | 0.15 | Min. | 100 |
| 12BT6 | 12.6 | 0.15 | Min. | 70 |
| 12BU6 | 12.6 | 0.15 | Min. | 16.5 |
| | | | | 16.0 |
| 12Q7GT | 12.6 | 0.15 | GT | 70 |
| 12S8GT | 12.6 | 0.15 | GT | 100 |
| 12SQ7/GT | 12.6 | 0.15 | Metal/GT | 100 |
| 12SR7 | 12.6 | 0.15 | Metal | 16 |
| 12SW7 | 12.6 | 0.15 | Metal | 17 |
| | | | | 16 |
| 14B6 | 12.6 | 0.15 | Lock-in | 100 |
| 14E6 | 12.6 | 0.15 | Lock-in | 16 |
| | | | | 16.5 |
| 14X7 | 12.6 | 0.15 | Lock-in | 85 |
| | | | | 100 |
| 19C8 | 18.9 | 0.15 | T-6½ | 100 |
| 19T8 | 18.9 | 0.15 | Min. | 70 |
| 26BK6 | 26.5 | 0.07 | Min. | 100 |
| 26C6 | 26.5 | 0.07 | Min. | 17 |
| | | | | 16 |
| 55/55S | 2.5 | 1.0 | ST-12 | 8.3 |
| 75 or 75S | 6.3 | 0.30 | ST-12 | 100 |
| 85 | 6.3 | 0.30 | ST-12 | 8.3 |
| 85AS | 6.3 | 0.30 | ST-12 | 20 |

## DUO-TRIODES

| Type | Ef | If | Style | Gm | μ |
|---|---|---|---|---|---|
| 2C21 | 6.3 | 0.60 | ST-12 | 1375 | 10.4 |
| 2C51 | 6.3 | 0.30 | T-6½ | 5500 | 35.0 |
| 2C52 | 12.6 | 0.30 | GT | 1900 | 100.0 |
| 3A5 | 1.4 | 0.22 | Min. | 1800 | 15.0 |
| | 2.8 | 0.11 | | | |
| 3B7 | 2.8 | 0.110 | Lock-in | 1900 | |
| | 1.4 | 0.220 | | | |
| 3C6 | 1.4 | 0.10 | Lock-in | 1300 | |
| | 2.8 | 0.05 | | 1300 | |
| | | | | 1100 | |
| 6AE7GT | 6.3 | 0.50 | GT | 3000 | 14.0 |
| 6AH7GT | 6.3 | 0.30 | GT | 1550 | 16.0 |
| | | | | 1900 | |
| 6BQ7 | 6.3 | 0.40 | T-6½ | 6000 | 35.0 |
| 6C8G | 6.3 | 0.30 | ST-12 | | 36.0 |
| 6F8G | 6.3 | 0.30 | ST-12 | 2600 | 20.0 |
| 6J6 | 6.3 | 0.45 | Min. | 5300 | 38.0 |
| 6N7/GT | 6.3 | 0.80 | Metal/GT | 3100 | 35.0 |
| | | | | 3200 | |
| 6SC7/GT | 6.3 | 0.30 | Metal/GT | 1325 | 70.0 |
| 6SL7GT, 6SL7WGT | 6.3 | 0.30 | GT | 1600 | 70.0 |
| 6SN7GT, 6SN7WGT | 6.3 | 0.60 | GT | 3000 | 20.0 |
| | | | | 2600 | |
| 6SU7GTY | 6.3 | 0.30 | GT | 1600 | 70.0 |
| 7AF7 | 6.3 | 0.30 | Lock-in | 2600 | 17.0 |
| | | | | 1900 | 16.0 |
| | | | | 2100 | |
| 7F7 | 6.3 | 0.30 | Lock-in | 1125 | 70.0 |
| | | | | 1600 | |
| 7F8 | 6.3 | 0.30 | Lock-in | 3300 | |
| 7N7 | 6.3 | 0.60 | Lock-in | 3000 | 20.0 |
| | | | | 2600 | |
| 12AH7GT | 12.6 | 0.15 | GT | 1550 | 16.0 |
| | | | | 1900 | |
| 12AT7 | 6.3 | 0.30 | T-6½ | 4000 | 54.0 |
| | 12.6 | 0.15 | | 6600 | 62.0 |
| | | | | 5500 | 55.0 |
| 12AU7 | 12.6 | 0.15 | T-6½ | 2200 | 17.0 |
| | 6.3 | 0.30 | | 3100 | 19.5 |
| 12AV7 | 12.6 | 0.225 | T-6½ | 6100 | 37.0 |
| | 6.3 | 0.450 | | 8500 | 41.0 |
| 12AX7 | 12.6 | 0.15 | T-6½ | 1250 | 100.0 |
| | 6.3 | 0.30 | | 1600 | |
| 12AY7 | 12.6 | 0.15 | T-6½ | 1750 | 40.0 |
| 12SC7 | 12.6 | 0.15 | Metal | 1325 | 70.0 |
| 12SL7GT | 12.6 | 0.15 | GT | 1600 | 70 |
| 12SN7GT | 12.6 | 0.15 | GT | 3000 | 20 |
| | | | | 2600 | |
| 12SX7GT | 12.6 | 0.30 | GT | 1800 | 21 |
| | | | | 3000 | 20 |
| | | | | 2600 | |
| 14AF7/XXD | 12.6 | 0.15 | Lock-in | 2600 | 17 |
| | | | | 1900 | 16 |
| | | | | 2100 | |
| 14F7 | 12.6 | 0.15 | Lock-in | 1125 | 70 |
| | | | | 1600 | |
| 14N7 | 12.6 | 0.15 | Lock-in | 3000 | 20 |
| | | | | 2600 | |
| 19J6 | 18.9 | 0.15 | Min. | 1900 | 38 |
| 5608-A | 2.5 | 2.0 | ST-14 | 2200 | 16 |
| | | | | 2450 | 17 |
| 5687 | 6.3 | 0.90 | T-6½ | 5200 | 16 |
| | 12.6 | 0.45 | | 8100 | |
| 5691 | 6.3 | 0.6 | GT | 1600 | 70 |
| 5692 | 6.3 | 0.6 | GT | 2200 | 20 |
| 5694 | 6.3 | 0.8 | ST-14 | 3100 | 35 |
| | | | | 3200 | |

## INDICATORS

| Type | Ef | If | Style | Target Current Ma. |
|---|---|---|---|---|
| 2E5 | 2.5 | 0.80 | T-9 | 1.0 |
| | | | | 4.0 |
| 6AB5/6N5 | 6.3 | 0.15 | T-9 | 2.0 |
| 6AD6G | 6.3 | 0.15 | T-9 | |
| 6AF6G | 6.3 | 0.15 | T-9 | |
| 6AL7GT | 6.3 | 0.90 | GT | |
| 6E5 | 6.3 | 0.30 | T-9 | 1.0 |
| | | | | 4.0 |
| 6T5 | 6.3 | 0.15 | ST-12 | 3.0 |
| 6U5 | 6.3 | 0.30 | T-9 | 1.0 |
| | | | | 4.0 |
| 1629 | 12.6 | 0.15 | GT | 1.0 |
| | | | | 4.0 |

## MULTI-PURPOSE TUBES

| Type | Ef | If | Style | Gm | Class |
|---|---|---|---|---|---|
| 1B8GT | 1.4 | 0.10 | GT | 275 | Diode-Triode Pent. |
| | | | | 1150 | |
| 1D8GT | 1.4 | 0.100 | GT | 325 | Diode-Triode Pent. |
| | | | | 925 | |
| 2B7 | 2.5 | 0.80 | ST-12 | 950 | Triode Pentode |
| | | | | 840 | |
| | | | | 1000 | |
| 3A8GT | 1.4 | 0.10 | GT | 325 | Diode-Triode Pent. |
| | 2.8 | 0.05 | | 750 | |
| 6AD7G | 6.3 | 0.85 | ST-14 | 325 | Triode Pentode |
| | | | | 2500 | |
| 6B7/S | 6.3 | 0.30 | ST-12 | 950 | Triode Pentode |
| | | | | 840 | |
| | | | | 1000 | |
| 7G8 | 6.3 | 0.30 | Lock-in | 2100 | Dual Tetrode |
| 12B8GT | 12.6 | 0.30 | GT | 1800 | Triode Pentode |
| | | | | 2400 | |
| 25A7GT | 25.0 | 0.30 | GT | 1800 | Rectifier-Pentode |
| 25B8GT | 25.0 | 0.15 | GT | 2000 | Triode Pentode |
| | | | | 1500 | |
| 25D8GT | 25.0 | 0.15 | GT | 1100 | Triode Pentode |
| | | | | 1900 | |
| 28D7/W | 28.0 | 0.40 | Lock-in | 3400 | Dual Tetrode |
| 32L7GT | 32.5 | 0.30 | GT | 6000 | Rectifier-Beam Amp. |
| 70A7GT | 70.0 | 0.15 | GT | 5800 | Rectifier-Beam Amp. |
| 70L7GT | 70.0 | 0.15 | GT | 7500 | Rectifier-Beam Amp. |
| 117L7/M7GT | 117.0 | 0.09 | GT | 5300 | Rectifier-Beam Amp. |
| 117N7GT | 117.0 | 0.09 | GT | 7000 | Rectifier-Beam Amp. |
| 117P7GT | 117.0 | 0.09 | GT | 5300 | Rectifier-Beam Amp. |

## POWER AMPLIFIERS
### Triodes
### Pentodes
### Beam Amplifiers
### Tetrodes
### Class B Duo Triodes

| Type | Ef | If | Style | Power Output Mw. |
|---|---|---|---|---|
| 1A5GT | 1.4 | 0.05 | GT | 100 |
| | | | | 115 |
| 1AC5 | 1.25 | 0.04 | T-3 | 450 |
| | | | | 600 |
| | | | | 700 |
| 1C5GT | 1.4 | 0.10 | GT | 200 |
| | | | | 240 |
| 1E7G | 2.0 | 0.24 | ST-12 | 575 |
| 1F4 | 2.0 | 0.12 | ST-12 | 310 |
| 1F5G | 2.0 | 0.12 | ST-12 | 310 |
| 1G5G | 2.0 | 0.12 | ST-14 | 250 |
| 1G6GT | 1.4 | 0.10 | GT | 675 |
| 1J5G | 2.0 | 0.12 | ST-14 | 575 |
| 1J6G | 2.0 | 0.24 | ST-12 | 2100 |
| | | | | 1900 |
| | | | | 1600 |
| 1LA4 | 1.4 | 0.05 | Lock-in | 100 |
| | | | | 115 |
| 1LB4 | 1.4 | 0.05 | Lock-in | 35 |
| | | | | 100 |
| | | | | 200 |
| 1Q5GT | 1.4 | 0.10 | GT | 270 |
| 1S4 | 1.4 | 0.10 | Min. | 65 |
| | | | | 270 |
| 1T5GT | 1.4 | 0.05 | GT | 170 |
| 1W4 | 1.4 | 0.05 | Min. | 35 |
| | | | | 90 |
| | | | | 100 |
| | | | | 200 |
| 2A3 | 2.5 | 2.50 | ST-16 | 3500 |
| | | | | 15000 |
| 2A5 | 2.5 | 1.75 | ST-14 | 3200 |
| | | | | 4800 |
| | | | | 11000 |
| | | | | 18000 |
| 3A4 | 1.4 | 0.20 | Min. | 600 |
| | 2.8 | 0.10 | | 700 |
| 3B5GT | 1.4 | 0.10 | GT | 70 |
| | 2.8 | 0.05 | | 180 |
| 3C5GT | 1.4 | 0.10 | GT | 1550 |
| | 2.8 | 0.05 | | 1450 |
| 3D6 | 2.8 | 0.110 | Lock-in | 600 |
| | 1.4 | 0.220 | | 1400 |
| 3E5 | 1.4 | 0.050 | Min. | 100 |
| | 2.8 | 0.025 | | 200 |
| | | | | 90 |
| | | | | 175 |
| 3LE4 | 2.8 | 0.05 | Lock-in | 300 |
| | 1.4 | 0.10 | | 325 |
| 3LF4 | 1.4 | 0.10 | Lock-in | 250 |
| | | | | 270 |
| | 2.8 | 0.05 | | 400 |
| | | | | 230 |
| | | | | 330 |
| 3Q4 | 1.4 | 0.10 | Min. | 250 |
| | 2.8 | 0.05 | | 270 |
| | | | | 240 |
| 3Q5GT | 1.4 | 0.10 | GT | 270 |
| | 2.8 | 0.05 | | 230 |
| 3S4 | 1.4 | 0.10 | Min. | 270 |
| | 2.8 | 0.05 | | 235 |
| 3V4 | 1.4 | 0.10 | Min. | 250 |
| | 2.8 | 0.05 | | 270 |
| | | | | 240 |
| 4A6G | 2.0 | 0.12 | ST-12 | |
| | 4.0 | 0.06 | | 1000 |
| 5A6 | 5.0 | 0.230 | T-6½ | 2800 |
| | 2.5 | 0.460 | | 3100 |
| 6A3 | 6.3 | 1.00 | ST-16 | 3200 |
| | | | | 1500 |
| | | | | 1000 |
| 6A4/LA | 6.3 | 0.30 | ST-14 | 700 |
| | | | | 1500 |
| 6A5G | 6.3 | 1.25 | ST-16 | 3750 |
| | | | | 15000 |
| 6A6 | 6.3 | 0.80 | ST-14 | 10000 |
| 6AB6G | 6.3 | 0.50 | ST-12 | 3500 |
| 6AC5GT | 6.3 | 0.40 | GT | 3700 |
| | | | | 8000 |
| 6AC6GT | 6.3 | 1.1 | GT | 3600 |
| 6AG7 | 6.3 | 0.65 | Metal | 3000 |
| 6AH5G | 6.3 | 0.9 | ST-16 | 10800 |
| 6AK6 | 6.3 | 0.15 | Min. | 1100 |
| 6AK7 | 6.3 | 0.65 | Metal | 3000 |
| 6AL6G | 6.3 | 0.9 | ST-16 | 10800 |
| 6AM5 | 6.3 | 0.2 | Min. | 1400 |
| 6AN5 | 6.3 | 0.45 | Min. | 1300 |
| 6AQ5 | 6.3 | 0.45 | Min. | 4500 |
| | | | | 2000 |
| 6AR5 | 6.3 | 0.40 | Min. | 3200 |
| | | | | 3400 |
| 6AS5 | 6.3 | 0.80 | Min. | 2200 |
| 6AS7G | 6.3 | 2.5 | GT | |
| 6B4G | 6.3 | 1.00 | ST-16 | 3200 |
| | | | | 1500 |
| | | | | 1000 |
| 6B5 | 6.3 | 0.80 | ST-14 | 4000 |
| 6BF5 | 6.3 | 1.2 | Min. | |
| 6BG6G | 6.3 | 0.90 | ST-16 | |
| 6CD6G | 6.3 | 2.5 | ST-16 | |
| 6E6 | 6.3 | 0.60 | ST-14 | 750 |
| | | | | 1600 |
| 6F6 | 6.3 | 0.70 | Metal | 3200 |
| 6F6G/GT | 6.3 | 0.70 | ST-14/GT | 4800 |
| | | | | 11000 |
| | | | | 18000 |
| 6G6G | 6.3 | 0.15 | ST-12 | 600 |
| | | | | 1100 |
| 6K6GT | 6.3 | 0.40 | GT | 350 |
| | | | | 3400 |
| | | | | 4500 |
| 6L6 | 6.3 | 0.90 | Metal | 6500 |
| 6L6G | 6.3 | 0.90 | ST-16 | 10800 |
| 6L6GA | 6.3 | 0.90 | ST-14 | 17500 |
| | | | | 26500 |
| | | | | 47000 |
| 6M5 | 6.3 | 0.71 | T-6½ | 3900 |
| 6N6G | 6.3 | 0.80 | ST-14 | 4000 |
| 6U6GT | 6.3 | 0.75 | GT | 2000 |
| | | | | 5500 |
| 6V6/GT | 6.3 | 0.45 | Metal/GT | 2000 |
| | | | | 4500 |
| | | | | 5500 |
| | | | | 10000 |
| | | | | 14000 |
| 6W6GT | 6.3 | 1.20 | GT | 2100 |
| | | | | 3800 |
| 6Y6G | 6.3 | 1.25 | ST-14 | 3600 |
| | | | | 6000 |
| 6Y7G | 6.3 | 0.60 | ST-12 | 5500 |
| | | | | 8000 |
| 6Z7G | 6.3 | 0.30 | ST-12 | 2500 |
| | | | | 4200 |
| 7A5 | 6.3 | 0.75 | Lock-in | 1500 |
| | | | | 2200 |
| 7B5 | 6.3 | 0.40 | Lock-in | 350 |
| | | | | 3400 |
| | | | | 4500 |
| 7C5 | 6.3 | 0.45 | Lock-in | 2000 |
| | | | | 4500 |
| | | | | 5500 |
| | | | | 10000 |
| | | | | 14000 |
| 10 | 7.5 | 1.25 | ST-16 | 400 |
| | | | | 900 |
| | | | | 1600 |
| 12A5 | 12.6 | 0.30 | | 800 |
| | 6.3 | 0.60 | ST-12 | 3400 |
| 12A6 | 12.6 | 0.15 | Metal | 3400 |
| 12A6GT | 12.6 | 0.15 | GT | 3400 |
| 12A7 | 12.6 | 0.3 | ST-12 | 550 |
| 12L8GT | 12.6 | 0.15 | GT | 300 |
| | | | | 1000 |
| 14A5 | 12.6 | 0.15 | Lock-in | 2800 |
| 14C5 | 12.6 | 0.15 | Lock-in | 2000 |
| | | | | 4500 |
| | | | | 5500 |
| | | | | 10000 |
| | | | | 14000 |
| 18 | 14.0 | 0.30 | ST-14 | 4800 |
| | | | | 11000 |
| | | | | 18000 |
| 19 | 2.0 | 0.26 | ST-12 | 2100 |
| | | | | 1900 |
| | | | | 1600 |
| 19BG6G | 18.9 | 0.30 | ST-16 | |
| 20 | 3.3 | 0.132 | T-8 | 50 |
| | | | | 130 |
| 25A6/GT | 25 | 0.30 | Metal/GT | 900 |
| | | | | 2000 |
| | | | | 2200 |
| 25A7GT | 25 | 0.30 | GT | 770 |
| 25AC5GT | 25 | 0.30 | GT | 2000 |
| 25B5 | 25 | 0.30 | ST-12 | 2000 |
| | | | | 3800 |
| 25B6G | 25 | 0.30 | ST-14 | 2400 |
| | | | | 7100 |
| 25C6G | 25 | 0.30 | ST-14 | 3600 |
| | | | | 6000 |
| 25L6 | 25 | 0.30 | Metal | 2100 |
| | | | | 4300 |
| 25L6GT | 25 | 0.30 | GT | 2100 |
| | | | | 4300 |
| 25N6G | 25 | 0.30 | ST-12 | 2000 |
| | | | | 3800 |
| 26A7GT | 26.5 | 0.6 | GT | 5500 |
| 31 | 2.0 | 0.13 | ST-12 | 185 |
| | | | | 375 |
| 32L7GT | 32.5 | 0.30 | GT | 1000 |
| 33 | 2.0 | 0.26 | ST-14 | 70 |
| | | | | 90 |
| 35A5 | 35.0 | 0.15 | Lock-in | 1500 |
| | | | | 1300 |
| 35B5 | 35.0 | 0.15 | Min. | 1500 |
| 35C5 | 35.0 | 0.15 | Min. | 1500 |
| 35L6GT | 35.0 | 0.15 | GT | 1500 |
| | | | | 3300 |
| 38 | 6.3 | 0.30 | ST-12 | 925 |
| | | | | 1050 |
| | | | | 1200 |
| 41 | 6.3 | 0.40 | ST-12 | 350 |
| | | | | 3400 |
| | | | | 4500 |
| 42 | 6.3 | 0.65 | ST-14 | 4800 |
| | | | | 11000 |
| | | | | 18000 |
| 43 | 25.0 | 0.30 | ST-14 | 900 |
| 45 | 2.5 | 1.50 | ST-14 | 830 |
| | | | | 1600 |
| | | | | 2000 |
| 46 | 2.5 | 1.75 | ST-16 | 1250 |
| 47 | 2.5 | 1.75 | ST-16 | 2700 |
| 48 | 30.0 | 0.40 | ST-16 | 2000 |
| | | | | 3000 |
| 49 | 2.0 | 0.12 | ST-14 | 170 |
| | | | | 3500 |
| 50 | 7.5 | 1.25 | ST-16 | 1600 |
| | | | | 2400 |
| | | | | 3400 |
| | | | | 4600 |
| 50A5 | 50.0 | 0.15 | Lock-in | 2100 |
| | | | | 4300 |
| 50B5 | 50.0 | 0.15 | Min. | 1900 |
| 50C5 | 50.0 | 0.15 | Min. | 1900 |
| 50C6G | 50.0 | 0.15 | ST-14 | 3600 |
| | | | | 6000 |
| 50L6GT | 50.0 | 0.15 | GT | 2100 |
| | | | | 4300 |
| VT52 | 7.7 | 5.0 | ST-17 | 1000 |
| 53 | 2.5 | 2.0 | ST-14 | 10000 |
| 59 | 2.5 | 2.0 | ST-16 | 1250 |
| | | | | 3000 |
| 71A | 5.0 | 0.25 | ST-14 | 125 |
| | | | | 400 |
| | | | | 790 |
| 79 | 6.3 | 0.60 | ST-12 | 5500 |
| | | | | 8000 |
| 89 | 6.3 | 0.40 | ST-12 | 300 |
| | | | | 1500 |
| | | | | 3500 |
| 182B/482B | 5.0 | 1.25 | ST-14 | 1350 |
| 183/483 | 5.0 | 1.25 | ST-14 | 1800 |

**Power Amplifiers (Cont'd)**

| Type | Ef | If | Style | Power Output Mw. |
|---|---|---|---|---|
| 210-T | 7.5 | 1.25 | ST-16 | 400 |
| | | | | 900 |
| | | | | 1600 |
| 950 | 2.0 | 0.12 | ST-14 | 1000 |
| 1276 | 6.3 | 1.00 | ST-16 | 3200 |
| | | | | 1500 |
| | | | | 1000 |
| 5686 | 6.3 | 0.35 | T-6½ | 2700 |
| 5824 | 25 | 0.30 | ST-14 | 4300 |
| 5932 | 6.3 | 0.90 | T-12 | 10800 |

**RECTIFIERS (GENERAL PURPOSE)**
**Including Voltage Doublers**

| Type | Ef | If | Style | Current Output Ma. |
|---|---|---|---|---|
| OY4 | ... | ... | Metal | 75 |
| OY4G | ... | ... | T-7 | 75 |
| OZ4 | ... | ... | Metal | 90 |
| OZ4A | ... | ... | Metal | 110 |
| OZ4G | ... | ... | T-7 | 90 |
| 1V | 6.3 | 0.30 | ST-12 | 45 |
| 2W3GT | 2.5 | 1.50 | GT | 55 |
| 2Z2/G84 | 2.5 | 1.50 | ST-12 | 50 |
| 5AX4GT | 5.0 | 2.25 | GT | 150 |
| 5AZ4 | 5.0 | 2.0 | Lock-in | 125 |
| 5R4GY | 5.0 | 2.0 | ST-16 | 150 |
| | | | | 175 |
| 5T4 | 5.0 | 2.0 | Metal | 225 |
| 5U4G | 5.0 | 3.0 | ST-16 | 225 |
| 5U4WG | 5.0 | 3.0 | T-12 | 225 |
| 5V4G | 5.0 | 2.0 | ST-14 | 175 |
| 5W4 | 5.0 | 1.50 | Metal | 110 |
| 5W4GT | 5.0 | 1.50 | GT | 110 |
| 5X3 | 5.0 | 2.0 | ST-14 | 110 |
| | | | | 30 |
| 5X4G | 5.0 | 3.0 | ST-16 | 225 |
| | | | | 125 |
| 5Y3GT | 5.0 | 2.0 | GT | 125 |
| 5Y4G | 5.0 | 2.0 | ST-14 | 125 |
| 5Z3 | 5.0 | 3.0 | ST-16 | 225 |
| 5Z4 | 5.0 | 2.0 | Metal | 125 |
| 5Z4GT | 5.0 | 2.0 | GT | 125 |
| 6AX5GT | 6.3 | 1.2 | GT | 125 |
| 6AX6GT+ | 6.3 | 2.5 | ST-14 | 250 |
| 6BY5G+ | 6.3 | 1.6 | ST-14 | 175 |
| 6U4GT | 6.3 | 1.2 | GT | 125 |
| 6V4 | 6.3 | 0.60 | T-6½ | 90 |
| 6W4GT | 6.3 | 1.2 | GT | 125 |
| 6X4 | 6.3 | 0.60 | Min. | 70 |
| 6X5 | 6.3 | 0.60 | Metal | 70 |
| 6X5GT | 6.3 | 0.60 | GT | 70 |
| 6X5WGT | 6.3 | 0.60 | GT | 70 |
| 6Y5 | 6.3 | 0.80 | ST-12 | 50 |
| 6Z4 | 6.3 | 0.60 | ST-12 | 60 |
| 6Z5 | 6.3 | 0.80 | | |
| | 12.6 | 0.40 | ST-12 | 60 |
| 6ZY5G | 6.3 | 0.30 | ST-12 | 40 |
| 7X6+ | 6.3 | 1.2 | Lock-in | 75 |
| 7Y4 | 6.3 | 0.50 | Lock-in | 70 |
| 7Z4 | 6.3 | 0.90 | Lock-in | 100 |
| 12Z3 | 12.6 | 0.30 | ST-12 | 55 |
| 14Y4 | 12.6 | 0.30 | Lock-in | 70 |
| 25W4GT | 25 | 0.30 | GT | 125 |
| 25X6GT+ | 25 | 0.15 | GT | 60 |
| 25Z4 | 25 | 0.30 | Metal | 125 |
| 25Z6+ | 25 | 0.30 | Metal | 75 |
| 25Z6GT+ | 25 | 0.30 | GT | 75 |
| 28Z5 | 28.0 | 0.24 | Lock-in | 100 |
| 35W4 | 35.0 | 0.15 | Min. | 60 |
| | | | | 100 |
| 35Y4 | 35.0 | 0.15 | Lock-in | 60 |
| | | | | 100 |
| 35Z3 | 35.0 | 0.15 | Lock-in | 100 |
| 35Z4GT | 35.0 | 0.15 | GT | 100 |
| 35Z5GT | 35.0 | 0.15 | GT | 100 |
| 35Z6G+ | 35.0 | 0.30 | ST-14 | 110 |
| 40Z5/ 45Z5GT | 45.0 | 0.15 | GT | 60 100 |
| 45Z3 | 2.5 | 1.50 | ST-14 | 65 |
| 50AX6G+ | 50.0 | 0.30 | ST-14 | 250 |
| 50Y6GT+ | 50.0 | 0.15 | GT | 75 |
| 50Z6G+ | 50 | 0.30 | ST-12 | 250 |
| 80 | 5.0 | 2.0 | ST-14 | 125 |
| 81 | 7.5 | 1.25 | ST-16 | 85 |
| 82 | 2.5 | 3.0 | ST-14 | 115 |
| 83 | 5.0 | 3.0 | ST-16 | 225 |
| 83V | 5.0 | 2.0 | ST-14 | 175 |
| 84/6Z4 | 6.3 | 0.50 | ST-12 | 60 |
| 117Z3 | 117 | 0.04 | Min. | 90 |
| 117Z4GT | 117 | 0.04 | GT | 90 |
| 117Z6GT+ | 117.0 | 0.075 | GT | 60 |
| 1005/ CK1005 | 6.3 | 0.1 | Metal | 70 |
| 1274 | 6.3 | 0.60 | GT | 70 |
| 1275 | 6.3 | 0.60 | ST-16 | 225 |
| 5517/ CK1013 | Cold K | | Min. | 6 |
| 5931 | 5.0 | 3.0 | T-12 | 225 |

+These types may also be used as voltage doublers.

**RECTIFIERS (HIGH VOLTAGE TV)**

| Type | Ef | If | Style | Output Current |
|---|---|---|---|---|
| 1B3GT | 1.25 | 0.20 | GT | 2.0 Ma. |
| 1V2 | 0.625 | 0.30 | T-6½ | 0.5 Ma. |
| 1X2 | 1.25 | 0.20 | T-6½ | 1.0 Ma. |
| 1Y2 | 1.5 | 0.29 | Min. | 2.0 Ma. |
| 1Z2 | 1.5 | 0.30 | Min. | 2.0 Ma. |
| 2V3G | 2.5 | 5.0 | ST-12 | 2.0 Ma. |
| 2X2 (A) | 2.5 | 1.75 | ST-12 | 7.5 Ma. |
| 6Y3G | 6.3 | 0.7 | ST-12 | 7.5 Ma. |
| 5642 | 1.25 | 0.140 | T-3 | 0.2 Ma. |

**RELAY TUBES**
**Gas Triodes and Tetrodes**

| Type | Ef | If | Style | Cath. Ma. |
|---|---|---|---|---|
| OA4G | Cold K | | ST-12 | 25 |
| 2A4G | 2.5 | 2.50 | ST-12 | 100 Max. |
| 2C4 | 2.5 | 0.65 | Min. | 5 |
| 2D21 | 6.3 | 0.60 | Min. | 100 Max. |
| 6D4 | 6.3 | 0.25 | Min. | 25 |
| 884 | 6.3 | 0.60 | ST-12 | 300 Peak |
| 885 | 2.5 | 1.50 | ST-12 | 300 Peak |
| 1267 | Cold K | | GT | 25 |
| 2050 | 6.3 | 0.60 | ST-12 | 100 Max. |
| 2051 | 6.3 | 0.60 | ST-12 | 75 Max. |

**TV SCANNERS (Horizontal)**

| Type | Ef | If | Style | Gm |
|---|---|---|---|---|
| 6AR6G | 6.3 | 1.20 | T-11 | 5400 |
| | | | | 4300 |
| 6AU5GT | 6.3 | 1.25 | GT | |
| 6AV5GT | 6.3 | 1.20 | GT | 5500 |
| 6BD5GT | 6.3 | 0.90 | GT | |
| 6BG6G | 6.3 | 0.90 | ST-1o | |
| 6BQ6GT | 6.3 | 1.20 | GT | |
| 6CD6G | 6.3 | 2.50 | ST-16 | 7500 |
| 25AV5GT | 25.0 | 0.30 | GT | 5500 |
| 25BQ6GT | 25.0 | 0.30 | GT | |

**TV SCANNERS (Vertical)**

| | | | | |
|---|---|---|---|---|
| 6AQ5 | 6.3 | 0.45 | Min. | 4100 |
| | | | | 3700 |
| 6BF5 | 6.3 | 1.20 | Min. | 4200 |
| 6BL7GT | 6.3 | 1.50 | T-9 | |
| 6K6GT | 6.3 | 0.40 | GT | 1500 |
| | | | | 2300 |
| | | | | 2100 |
| 6S4 | 6.3 | 0.60 | T-6½ | 4500 |
| 6SL7GT | 6.3 | 0.30 | GT | 1600 |
| 6SN7GT | 6.3 | 0.30 | GT | 3000 |
| | | | | 2600 |
| 6V6GT | 6.3 | 0.45 | GT | 3700 |
| | | | | 4100 |
| | | | | 3750 |
| 6Y6G | 6.3 | 1.25 | ST-14 | 7000 |
| | | | | 7100 |
| 7C5 | 6.3 | 0.45 | Lock-in | 3700 |
| | | | | 4100 |
| | | | | 3750 |
| 12BH7 | 12.6 | 0.30 | T-6½ | 6200 |
| | 6.3 | 0.60 | | 3100 |

**TRIODES (GENERAL PURPOSE)**

| Type | Ef | If | Style | μ |
|---|---|---|---|---|
| 1C3 | 1.4 | 0.05 | Min. | 14.5 |
| 1E4G | 1.4 | 0.05 | GT | 14.5 |
| | | | | 14.0 |
| 1G4GT | 1.4 | 0.05 | GT | 8.8 |
| 1LE3 | 1.4 | 0.05 | Lock-in | 14.5 |
| | | | | 14.0 |
| 2C22 | 6.3 | 0.3 | T-9 | 20.0 |
| 6AD5G/GT | 6.3 | 0.30 | ST-12/GT | 100 |
| 6AE5GT | 6.3 | 0.30 | GT | 4.2 |
| 6AF5G | 6.3 | 0.30 | ST-12 | 7.4 |
| 6C4 | 6.3 | 0.15 | Min. | 17 |
| | | | | 19.5 |
| 6C5/GT | 6.3 | 0.30 | Metal/GT | 20 |
| 6F5/GT | 6.3 | 0.30 | Metal/GT | 100 |
| 6J4 | 6.3 | 0.40 | Min. | 55 |
| 6J5/GT | 6.3 | 0.30 | Metal/GT | 20 |
| 6K5G/GT | 6.3 | 0.30 | ST-12/GT | 70 |
| 6L5G | 6.3 | 0.15 | ST-12 | 15 |
| | | | | 17 |
| 6N4 | 6.3 | 0.20 | Min. | 32 |
| 6P5 | 6.3 | 0.30 | GT | 13.8 |
| 6Q4 | 6.3 | 0.48 | T-6½ | 80 |
| 6SF5/GT | 6.3 | 0.30 | Metal/GT | 100 |
| 7A4 | 6.3 | 0.30 | Lock-in | 20 |
| 7B4 | 6.3 | 0.30 | Lock-in | 100 |
| 12A | 5.0 | 0.25 | ST-14 | 8.5 |
| 12A4 | 6.3 | 0.60 | T-6½ | 20 |
| | 12.6 | 0.30 | | |
| 12E5GT | 12.6 | 0.15 | GT | 13.8 |
| 12F5GT | 12.6 | 0.15 | GT | 100 |
| 12J5GT | 12.6 | 0.15 | GT | 20 |
| 12SF5/GT | 12.6 | 0.15 | Metal/GT | 100 |
| 14A4 | 12.6 | 0.15 | Lock-in | 20 |
| 26 | 1.5 | 1.05 | ST-14 | 8.3 |
| 27, 27S | 2.5 | 1.75 | ST-12 | 9.0 |
| 30 | 2.0 | 0.06 | ST-12 | 9.3 |
| 37 | 6.3 | 0.30 | ST-12 | |
| 40 | 5.0 | 0.25 | ST-14 | |
| 56/56S | 2.5 | 1.00 | ST-12 | 13.8 |
| 56AS | 6.3 | 0.40 | ST-12 | |
| 76 | 6.3 | 0.30 | ST-12 | 13.8 |
| V-99 | 3.3 | 0.063 | T-8 | 6.6 |
| X-99 | 3.3 | 0.063 | T-9 | 6.6 |
| 485 | 3.0 | 1.25 | ST-12 | 12.5 |
| 864 | 1.1 | 0.25 | T-9 | 8.2 |
| 1230 | Special Type 30 | | | |
| 9002 | 6.3 | 0.15 | Min. | 25 |
| XXL | 6.3 | 0.30 | Lock-in | 25 |
| | | | | 30 |

**TRIODES H.F. — OSCILLATORS H.F.**
**Single Triodes — Duo Triodes**

| Type | Ef | If | Style | Gm |
|---|---|---|---|---|
| 3A5 | 1.4 | 0.22 | Min. | 1800 |
| | 2.8 | 0.11 | | |
| 6AB4 | 6.3 | 0.15 | Min. | 5500 |
| 6BQ7 | 6.3 | 0.40 | T-6½ | 6000 |
| 6C4 | 6.3 | 0.15 | Min. | 2200 |
| | | | | 3100 |
| 6F4 | 6.3 | 0.225 | Acorn | 5800 |
| 6J4 | 6.3 | 0.40 | Min. | 12000 |
| 6J6 | 6.3 | 0.45 | Min. | 5300 |
| 6L4 | 6.3 | 0.225 | Acorn | 6400 |
| 6R4 | 6.3 | 0.20 | T-6½ | 5500 |
| 7A4 | 6.3 | 0.30 | Lock-in | 3000 |
| | | | | 2600 |
| 7E5 | 6.3 | 0.15 | Lock-in | 3000 |
| 7F8, 7F8W | 6.3 | 0.30 | Lock-in | 5200 |
| 12AT7 | 6.3 | 0.30 | T-6½ | 4000 |
| | 12.6 | 0.15 | | 6600 |
| | | | | 5500 |
| 14F8 | 6.3 | 0.30 | Lock-in | 5200 |
| 19J6 | 18.9 | 0.15 | Min. | 1900 |
| 1293 | 1.4 | 0.11 | Lock-in | 1500 |
| 1626 | 12.6 | 0.25 | ST-12 | |

**SPECIAL PURPOSE TUBES**

| Type | Ef | If | Style | Use |
|---|---|---|---|---|
| 6AE6G | 6.3 | 0.15 | ST-12 | |
| 6BN6 | 6.3 | 0.3 | Min. | Limiter-Disc'r |
| 12BN6 | 12.6 | 0.15 | Min. | Limiter-Disc'r |
| 5722 | 4.9 | 1.6 | Min. | For Noise Gen. |
| X6030 | 3.0 | 0.6 | Lock-in | For Noise Gen |

# CIRCUIT MODIFICATIONS REQUIRING ADDITIONAL RESISTORS

**This article, originally printed in "Sylvania News," covers the essential information service technicians need to know in order to substitute tubes in series strings when either the voltage or current is different from that of the original tube type.**

SERVICE technicians should have little trouble making tube substitutions in AC-DC sets as long as the substitute tube operates on the same current as the original tube. If the voltage is different, a slight change in the series resistor will be required. However, when the tube current is either higher or lower, the resistor changes are more complicated. The principles involved for both cases are explained in the following examples which can be applied to any substitution desired.

Fig. 1 shows a typical 300 ma. filament string including a series resistance of approximately 150 ohms exclusive of the tapped section. The resistor is shown as a tapped resistor since in many cases ballast resistors with the tap were used. In this case the pilot lamp rating will be less than 300 ma. Many receivers were built in which a 300 ma. pilot lamp was employed and no resistance was shunted across it. For those cases the resistor shunting the pilot light in Fig. 1 may be considered to be open.

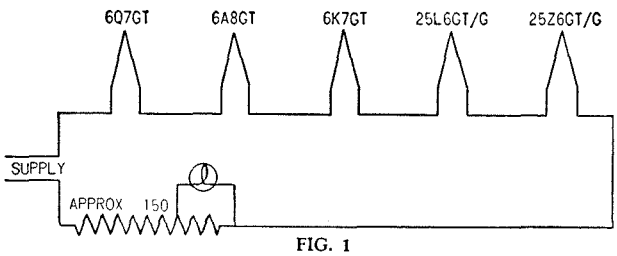



FIG. 1

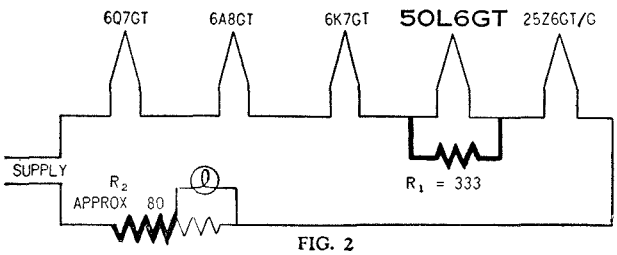



FIG. 2

$$R1 = \frac{\text{Filament Volts of 150 ma. tube}}{.150}$$

$$R2 = \frac{\text{120 minus sum of tube voltages}}{.300}$$

Let us now suppose that the 25L6GT/G tube has burned out and that it is impossible to obtain another output tube of this type. Assume that the only power output tube obtainable is the 50L6GT. This tube requires only 150 ma. and, therefore, we must shunt the filament with a resistance which will by-pass 150 ma. of the total heater current. This will require a resistance of 333 ohms. A 300 ohm resistor will be perfectly satisfactory in this application. Originally the total voltage drop across the tubes was 68.9 volts leaving 48.1 volts drop across the series resistor. In the revised circuit the total voltage drop across the filaments of the tubes for proper operation will now be 93.9 volts. This means, therefore that the series resistor must be reduced in value to approximately 80 ohms in order that 300 ma. will flow through the filament string. This series resistor may be in the form of a line cord or actually may be a resistor mounted in the receiver itself. If it is in the line cord, a resistor of from 150 to 175 ohms may be shunted across the cord provided room may be found to locate this resistor. This resistor will, of course, become quite warm and must be placed in such a position that the added heat from the resistor will not cause wax in condensers to melt. If the resistor is mounted in the receiver to begin with, and if a 75 to 80 ohm resistor of the same physical size can be obtained, then it should be substituted for the one which was originally in the receiver.

The same general procedure must be followed if we wish to replace any one of the other tubes in the string with a 150 ma. tube. Fig. 2 illustrates in heavy lines the changes which must be made.

To summarize, there are three things which must be done in making a change of this kind:

1. The filament of the 150 ma. tube must be shunted.

2. The series resistor must be reduced in value so that 300 ma. is still available for the filament string.

3. These resistors must be located in such a place that the added heat will not cause trouble.

Let us now consider the filament string shown in Fig. 3. A great many more receivers are on the market employing a circuit similar to the one shown. This differs from the circuit shown in Fig. 1 in that no series resistor is employed and that the pilot light is lighted from a tap on the 35Z5GT/G filament.

No series resistor is necessary since the sum of the voltages required across the entire filament string is 122.8 volts. A receiver with such a circuit comes in to be repaired and the 50L6GT has an open filament. Let us assume that the only output type available from the jobber is a type 25L6G. This tube requires 300 ma.

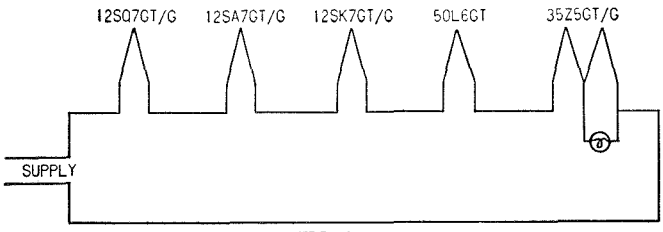



FIG. 3

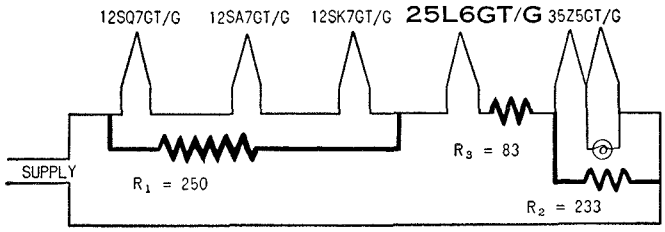



FIG. 4

$$\text{R1 or R2} = \frac{\text{Sum or tube voltages across resistor}}{.150}$$

$$\text{R3} = \frac{\text{Old tube volts—new tube volts}}{.300}$$

filament current. However, it can be employed provided we rewire the circuit in such a manner that 300 ma. can be supplied to the filament of the 25L6GT/G. This can be accomplished by shunting the three 12-volt tubes with a 250 ohm resistor as shown in Fig. 4 and by shunting the 35Z5GT/G with a 233 ohm resistor (250 ohms would be satisfactory).

The sum of the voltages across all of the filaments now adds up to 97.8 volts, therefore, a series resistor must be added to the string so that the total will add up to approximately the line voltage. The value of this resistor should be approximately 83 ohms. This resistor may be added at any place in the string but it must be added in such a position that the total 300 ma. flows through that resistor. If the tube which has to be replaced is located at either end of the filament string such as the 35Z5GT/G or the 12SQ7GT/G in Fig. 3, then only one shunting resistor would be required. The biggest problem may very well be to find a place for the three resistors which will be required in most instances.

The power dissipated in these resistors will be considerable and precautions must be observed to prevent the heat developed from causing damage to the receiver. The wattage dissipated by a receiver changed over in the manner indicated in Fig. 4 dissipates twice the wattage that the receiver originally was designed for and all of that heat must be gotten rid of so that permanent damage to condensers and other parts in the receiver will not result. As in Fig. 2, the final changes are indicated in Fig. 4 with heavy lines.

The wattage rating of the resistors required in these circuits is found by multiplying the resistor current in amperes by the voltage across the resistor.

$$W = E \cdot I$$

Thus in the example shown as figures 3 and 4 the watts dissipated in R1 will be

$$37.8 \times .150 = 5.7 \text{ Watts}$$

37.8 comes from 3 tubes at 12.6 volts each, and the .150 amperes is the current through the resistor, another .150 amperes flows through the tubes.

Similarly the watts dissipated in R3 will be

$$25 \times .300 = 7.5 \text{ Watts}$$

The wattage rating of a resistor is the amount it can safely dissipate in the open air.

Unfortunately it is nearly always impossible to place these resistors in the open, and for use in confined spaces, like under the chassis, a factor of safety of at least 2 and preferably 3 is necessary, making the above values 15 and 20 Watts respectively.

To summarize, when a 300 ma. tube is used to replace a 150 ma. tube, there are three things which must be observed:

1. Shunt resistors must be added to the 150 ma. tubes in the receiver so that the tube which is being used as a replacement can obtain its full 300 ma.

2. A series resistor which will carry 300 ma. must be added to restore the voltage distribution across the filament string to its original value.

3. The series and shunt resistors must be placed in such a manner that the additional heat now developed in the receiver will not cause permanent damage.

Obviously there are many changes which may have to be made in equipment other than those indicated but the examples given were chosen as typical ones which you no doubt will have to make in the future. It is hoped that these suggestions will save you time in keeping your customers' receivers in condition.

For details of changes indicated Refer to page 13

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | NO CHANGES | FIL. VOLTS | FIL. CURRENT | REWIRE SOCKET | CHANGE SOCKET | REALIGN | ADD TOP CAP CONNECTION | REMOVE TOP CAP CONNECTION OR PLATE | CHANGE BIAS VOLTS | NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | H | K | |
| 1A4 (P or T) | 1A4 (P or T) | A | | | | | | | | | |
| | 1D5G | | | | | E | F | | | | |
| | 1E5G (P) | | | | | E | F | | | | |
| | 1LN5 | | B | C | | E | F | | H | | 1 |
| | 1N5GT | | B | C | | E | F | | | | 1 |
| | 1LC5 | | B | C | | E | F | | H | | 1 |
| | 1T4 | | B | C | | E | F | | H | | 1 |
| | 1L4 | | B | C | | E | F | | H | | |
| | 34 | | | | | | F | | | | |
| | 32 | | | | | | F | | | | 1 |
| 1A5GT | 1LA4 | | | | | E | | | | | 8 |
| | 1LB4 | | | | | E | | | | K | |
| | 1T5GT | | | | | | | | | K | 2 |
| | 1N6G | | | | D | | | | | K | |
| | 1C5GT | | | | | | | | | K | |
| | 1Q5GT | | | C | | | | | | K | 2 |
| | 1W4 | | | | | E | | | | K | 2 |
| | 3Q5GT | | | C | D | | | | | K | 2 |
| | 3D6 | | | C | | E | | | | K | 2 |
| | 3Q4 | | | C | | E | | | | K | 2 |
| | 3S4 | | | C | | E | | | | K | 2 |
| | 3V4 | | | C | | E | | | | | 2 |
| | 1S4 | | | C | | E | | | | K | 2 |
| | 3LF4 | | | C | | E | | | | K | 2 |
| 1A6 | 1C6 | | | C | | | F | | | | |
| | 1D7G | | | | | E | F | | | | |
| | 1C7G | | | C | | E | F | | | | |
| | 1A7GT | | B | C | | E | F | | H | K | |
| | 1LA6 | | B | C | | E | F | | H | K | |
| | 1LC6 | | B | C | | E | F | | H | K | |
| 1A7GT | 1L6 | | | | | E | F | | H | | |
| | 1LC6 | | | | | E | F | | H | | 6 |
| | 1LA6 | | | | | E | F | | H | | |
| | 1B7GT | | | C | | | F | | | | |
| | 1D8GT | | | C | D | | F | | | | 9 |
| | 3A8GT | | | C | D | | F | | | | 9 |
| | 1R5 | | | | | E | F | | H | | 11 |
| 1B4 (P or T) | 32 | | | | | | F | | | | |
| | 1E5G (P or T) | | | | | E | F | | | | |
| | 1LN5 | | B | C | | E | F | | H | | |
| | 1LC5 | | B | C | | E | F | | H | | |
| | 1T4 | | B | C | | E | F | | H | | |
| | 1N5GT | | | | | E | F | | | | |
| | 1P5GT | | | | | E | F | | | | |
| 1B7GT | 1A7GT | | | C | | | F | | | | |
| | 1LC6 | | | C | | E | F | | | | 6 |
| | 1LA6 | | | C | | E | F | | | | |
| | 3A8GT | | | | D | | F | | | | 9 |
| 1B8GT | 1S5 | Adaptor with | | | | | | | | | |
| | 1W4 | 2 Min. sockets | | | | | | | H | | |
| | 1U5 | Adaptor with | | | | | | | | | |
| | 1W4 | 2 Min. sockets | | | | | | | H | | |
| 1C5GT | 1A5GT | | | C | | | | | | K | 2 |
| | 1LA4 | | | C | | E | | | | K | 2 |
| | 1LB4 | | | C | | E | | | | K | 2 |
| | 1Q5GT | | | | | | | | | K | |
| | 1S4 | | | C | | E | | | | K | |
| | 1T5GT | | | | | | | | | K | 2 |
| | 1W4 | | | | | E | | | | K | 2 |
| | 3D6 | | | C | | E | | | | K | |
| | 3LF4 | | | C | | E | | | | K | |
| | 3Q4 | | | | | E | | | | K | |
| | 3Q5GT | | | | D | | | | | K | |
| | 3S4 | | | | | E | | | | K | |
| | 3V4 | | | | | E | | | | K | |
| 1C6 | 1A6 | | | C | | | F | | | | |
| | 1C7G | | | | | E | F | | | | |
| 1C6 (Continued) | 1D7G | | | C | | E | F | | | | |
| | 1A7GT | | B | C | | E | F | | | K | |
| | 1LA6 | | B | C | | E | F | | H | K | |
| | 1B7GT | | B | C | | E | F | | | K | |
| | 1LC6 | | B | C | | E | F | | H | K | 6 |
| 1C7G | 1A6 | | | C | | E | F | | | | |
| | 1C6 | | | | | E | F | | | | |
| | 1D7G | | | C | | | F | | | | |
| | 1A7GT | | B | C | | | F | | | K | |
| | 1LA6 | | B | C | | E | F | | | K | |
| | 1B7GT | | B | C | | | F | | | K | |
| | 1LC6 | | B | C | | E | F | | H | K | 6 |
| 1D5G (P or T) | 1A4 (P or T) | | | | | E | F | | | | |
| | 34 | | | | | E | F | | | | |
| | 1N5GT | | B | C | | | F | | | K | 1 |
| | 1E5G (P or T) | | | | | | F | | | | 1 |
| | 1B4 (P or T) | | | | | | F | | | | 1 |
| | 32 | | | | | | F | | | | 1 |
| | 1P5GT | | B | C | | | F | | | | |
| | 1LN5 | | B | C | | E | F | | H | K | 1 |
| | 1LC5 | | B | C | | E | F | | H | K | 6–1 |
| 1D7G | 1A6 | | | | | E | F | | | | |
| | 1C7G | | | C | | | F | | | | |
| | 1C6 | | | C | | E | F | | | | |
| | 1A7GT | | B | | | | F | | | K | |
| | 1LA6 | | B | C | | E | F | | H | K | |
| | 1B7GT | | B | C | | | F | | | K | |
| | 1LC6 | | B | C | | E | F | | H | K | 6 |
| 1D8GT | 1N6G | Requires room for 2 sockets, | | | | | | | | | |
| | 1E4G | no single replacement type. | | | | | | | | | |
| | 1LB4 | Requires room for 2 sockets, | | | | | | | | | |
| | 1LH4 | no single replacement type. | | | | | | | | | |
| | 1C3 | Adaptor with | | | | | | | | | |
| | 1W4 | 2 Min. sockets | | | | | | | H | | 5 |
| 1E4G | 1G4GT | | | | | | | | | K | |
| | 1LE3 | | | | | E | | | | K | |
| | 1N5GT | | | | D | | | G | | K | 4 |
| 1E5G (P or T) | 1B4 | | | | | E | F | | | | |
| | 32 | | | | | E | F | | | | |
| | 1N5GT | | B | C | | | F | | | K | |
| | 1D5G (P or T) | | | | | | F | | | | 1 |
| | 1A4 (P or T) | | | | | E | F | | | | 1 |
| | 34 | | | | | E | F | | | | 1 |
| | 1LN5 | | B | C | | E | F | | H | K | |
| | 1LC5 | | B | C | | E | F | | H | K | 6 |
| 1E7G | 2 type 1F5G | requires room for 2 sockets, | | | | | | | | | |
| | 2 type 1F4 | no single type. | | | | | | | | | |
| | 2 type 1S4 | B C Adaptor with | | | | | | | | K | |
| | 2 type 1W4 | B C 2 min. sockets | | | | | | | | K | |
| 1F4 | 1F5G | | | | | E | | | | | |
| | 33 | | | C | | | | | | K | 2 |
| | 1G5G | | | | | E | | | | K | 2 |
| | 1A5GT | | B | C | | E | | | | K | 2 |
| | 1C5GT | | B | C | | E | | | | K | 2 |
| | 1Q5GT | | B | C | | E | | | | K | 2 |
| | 1LB4 | | B | C | | E | | | | K | 2 |
| | 3D6 | | B | C | | E | | | | K | 2 |
| | 3LF4 | | B | C | | E | | | | K | 2 |
| 1F5G | 1F4 | | | | | E | | | | | |
| | 33 | | | | | E | | | | | |
| | 1G5G | | | | | | | | | K | 2 |
| | 1A5GT | | B | C | | | | | | K | 2 |
| | 1C5GT | | B | C | | | | | | K | 2 |
| | 1Q5GT | | B | C | | | | | | K | 2 |
| | 1LB4 | | B | C | | | | | | K | 2 |
| | 3D6 | | B | C | | | | | | K | 2 |

The G, GT or GT/G Types may be used interchangeably when space permits.

For details of changes indicated Refer to page 13

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | NO CHANGES | FIL. VOLTS | FIL. CURRENT | REWIRE SOCKET | CHANGE SOCKET | REALIGN | ADD TOP CAP CONNECTION | REMOVE TOP CAP CONNECTION | CHANGE BIAS OR PLATE VOLTS | NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | A | B | C | D | E | F | G | H | K | |
| 1F5G | 1J5G | | | | | | | | | | K | |
| (Continued) | 3LF4 | | | B | C | | E | | | | K | 2 |
| 1F6 | 1F7G | | | | | | E | F | | | | |
| | 3A8GT | | | B | C | | E | F | | | K | |
| | 1S5 | | | B | C | | E | F | | | K | |
| | 1LD5 | | | B | C | | E | F | | | K | |
| 1F7G | 1F6 | | | | | | E | F | | | | |
| | 3A8GT | | | B | C | D | | F | | | K | 9 |
| | 1S5 | | | B | C | | E | F | | | K | |
| | 1LD5 | | | B | C | | E | F | | | K | |
| 1G4GT | 1E4G | | | | | | | | | | K | |
| | 1LE3 | | | | | | E | | | | K | |
| 1G5G | 1F5G | | | | | | | | | | K | 2 |
| | 1F4 | | | | | | E | | | | K | 2 |
| | 33 | | | | | | E | | | | | 2 |
| | 1T5GT | | | B | C | | | | | | K | 2 |
| | 1A5GT | | | B | C | | | | | | K | 2 |
| | 1C5GT | | | B | C | | | | | | K | |
| | 1Q5GT | | | B | C | | | | | | K | |
| | 1LA4 | | | B | C | | E | | | | K | 2 |
| | 1LB4 | | | B | C | | E | | | | K | 2 |
| | 3D6 | | | B | C | | E | | | | K | |
| | 3LE4 | | | B | C | | E | | | | K | 2 |
| | 3LF4 | | | B | C | | E | | | | K | |
| | 3Q5G | | | B | C | D | | | | | K | |
| | 1J5G | | A | | | | | | | | | |
| 1G6GT | 1J6G | | | B | C | | | | | | | |
| | 19 | | | B | C | | E | | | | | |
| | 3B7 | | | B | C | | E | | | | | |
| 1H4G | 30 | | | | | | E | | | | | |
| | 1E4G | | | B | C | | | | | | K | |
| | 1G4GT | | | B | C | | | | | | K | |
| | 1LE3 | | | B | C | | E | | | | K | |
| 1H5GT | 1C3 | | | | | | E | | | H | | 5 |
| | 1H6G | | | B | C | D | | | | H | K | |
| | 1LH4 | | | | | | E | | | H | | 8 |
| | 3A8GT | | | | | D | | | | H | | 9 |
| | 1LD5 | | | | | | E | | | H | | 3 |
| 1H6G | 1B5 | | | | | | E | | | | | |
| | 1H5GT | | | B | C | | | | | | K | 5 |
| | 1LH4 | | | B | C | | E | | | | K | 5 |
| | 3A8GT | | | | | D | | | | | K | 9–5 |
| 1J5G | 1G5G | | A | | | | | | | | | |
| | 1F5G | | | | | | | | | | K | |
| | 1F4 | | | | | | E | | | | K | |
| | 33 | | | | | | E | | | | K | |
| | 1A5GT | | | B | C | | | | | | K | 2 |
| | 3LF4 | | | B | C | | E | | | | K | 2 |
| | 1C5GT | | | B | C | | | | | | K | 2 |
| | 1Q5GT | | | B | C | | | | | | K | 2 |
| | 3Q5GT | | | B | C | D | | | | | K | |
| | 3D6 | | | B | C | | E | | | | K | 2 |
| | 1D8GT | | | B | C | | | | | | K | 9 |
| | 1T5GT | | | B | C | | | | | | K | |
| 1J6G | 19 | | | | | | E | | | | | |
| | 1G6G | | | B | C | | | | | | | |
| | 3B7 | | | B | C | | E | | | | | |
| 1L4 | 1T4 | | | | | | | F | | | | 1 |
| | 1U4 | | | | | | | F | | | | 1 |
| | 1AF4 | | | | C | | | F | | | | |
| 1L6 | 1R5 | | | | | D | | F | | | | 11–6 |
| | 1LA6 | | | | | | E | F | | | | |
| | 1LC6 | | | | | | E | F | | | | |

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | NO CHANGES | FIL. VOLTS | FIL. CURRENT | REWIRE SOCKET | CHANGE SOCKET | REALIGN | ADD TOP CAP CONNECTION | REMOVE TOP CAP CONNECTION | CHANGE BIAS OR PLATE VOLTS | NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | A | B | C | D | E | F | G | H | K | |
| 1LA4 | 1A5GT | | | | | | E | | | | | |
| | 1C5GT | | | | C | | E | | | | K | 2 |
| | 1Q5GT | | | | C | | E | | | | | 2 |
| | 1D8GT | | | | C | | E | | | | K | 9–2 |
| | 3D6 | | | | C | | | | | | | 2 |
| | 3Q5GT | | | | C | | E | | | | | 2 |
| | 1LB4 | | | | | | | | | | K | 2 |
| | 3LF4 | | | | C | D | | | | | | 2 |
| 1LA6 | 1A7GT | | | | | | E | F | | H | | |
| | 1LC6 | | | | | | | F | | | | 6 |
| | 3A8GT | | | | C | | E | F | | | | 9–2 |
| 1LB4 | 1LA4 | | | | | | | | | | K | 2 |
| | 3D6 | | | | C | D | | | | | K | |
| | 3LE4 | | | | C | D | | | | | | 2 |
| | 3LF4 | | | | C | D | | | | | K | 2 |
| | 1T5GT | | | | | | E | | | | K | |
| | 1A5GT | | | | | | E | | | | | |
| | 1C5GT | | | | C | | E | | | | K | 2 |
| | 1S4 | | | | C | | E | | | | K | 2 |
| | 1W4 | | | | | | E | | | | | |
| | 3V4 | | | | C | | E | | | | K | |
| | 3Q4 | | | | C | | E | | | | K | |
| 1LC5 | 1LN5 | | | | | | | F | | | K | |
| | 1L4 | | | | | | E | F | | | | |
| | 1N5GT | | | | | | E | F | | | | 7 |
| | 1U4 | | | | | | E | F | | | | |
| | 1LG5 | | | | | | E | F | | | | |
| | 3A8GT | | | | C | | E | F | | | | 9–7 |
| | 5910 | | | | | | E | F | | | | |
| 1LC6 | 1A7GT | | | | | | E | F | | | | 7 |
| | 1LA6 | | | | | | | F | | | | 7 |
| | 1L6 | | | | | | E | F | | | | |
| | 1R5 | | | | | | E | F | | | | 11 |
| | 3A8GT | | | | C | | E | F | G | | | 9 |
| 1LD5 | 1S5 | | | | | | E | F | | | | |
| | 1D8GT | | | | C | | E | F | | | K | 9–7 |
| | 1N6G | | | | | | E | F | | | K | 7 |
| | 1U5 | | | | | | E | | | | | |
| | 1L4 | | | | | | E | | | | | 5 |
| | 3A8GT | | | | C | | E | F | | | | 9–7 |
| 1LE3 | 1G4GT | | | | | | E | | | | K | |
| | 1E4G | | | | | | E | | | | | |
| | 1D8GT | | | | | | E | | | | K | 9 |
| | 1C3 | | | | | | E | | | | | |
| | 1L4 | | | | | | E | | | | | 4 |
| 1LH4 | 1H5GT | | | | | | E | | | | | |
| | 3A8GT | | | | | | E | | | | | 9 |
| | 1LN5 | | | | | D | | | | | | 3 |
| 1LN5 | 1N5GT | | | | | | E | F | | | | |
| | 1LC5 | | | | | | | F | | | | 6 |
| | 1L4 | | | | | | E | F | | | K | |
| | 1U4 | | | | | | E | F | | | | |
| | 3A8GT | | | | C | | E | F | | | | 9 |
| 1N5GT | 1T4 | | | | | | E | F | | H | | 8 |
| | 1L4 | | | | | | E | F | | H | | |
| | 1LN5 | | | | | | E | F | | H | | 8 |
| | 1LC5 | | | | | | E | F | | H | | 6 |
| | 1U4 | | | | | | E | F | | H | | |
| | 3A8GT | | | | | D | | F | | | | 9 |
| 1N6G | 1A5GT | | | | | D | | | | | | 5 |
| | 1D8GT | | | | C | D | | | | | | 9 |
| | 1LA4 | | | | | | E | | | | | 5 |
| | 1LB4 | | | | | | E | | | | K | 5–2 |
| | 1Q5GT | | | | C | D | | | | | | 5–2 |
| | 1T5GT | | | | | D | | | | | | 5–2 |
| | 1W4 | | | | | | E | | | | K | 5–2 |

The G, GT or GT/G Types may be used interchangeably when space permits.

For details of changes indicated Refer to page 13

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | NO CHANGES | FIL. VOLTS | FIL. CURRENT | REWIRE SOCKET | CHANGE SOCKET | REALIGN | CHANGE BIAS OR PLATE VOLTS | REMOVE OR ADD CONNECTION | REMOVE OR ADD TOP CAP CONNECTION | CHANGE BIAS OR PLATE VOLTS | NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | H | K | | |
| 1P5GT | 1N5GT | | | | | | F | | | | | 1 |
| | 1L4 | | | | | E | F | | | | | 1 |
| | 1LG5 | | | | | E | F | | | | | |
| | 1LN5 | | | | | E | F | | | | | 1 |
| | 1LC5 | | | | | E | F | | | | | 1–6 |
| | 1T4 | | | | | E | F | | | | | 6 |
| | 1U4 | | | | | E | F | | | | | 1 |
| | 3A8GT | | | | D | | F | | | | | 9–1 |
| | 5910 | | | | | E | F | | | | | 1 |
| 1Q5GT | 1T5GT | | | C | | | | | | K | | 2 |
| | 1C5GT | | | | | | | | | K | | |
| | 1A5GT | | | C | | | | | | | | 2 |
| | 1D8GT | | | C | | | | | | K | | 9–2 |
| | 3D6 | | | C | | E | | | | | | |
| | 1LA4 | | | C | | E | | | | | | 2 |
| | 1LB4 | | | | | E | | | | K | | 2 |
| | 1S4 | | | | | E | | | | | | 6 |
| | 1W4 | | | C | | E | | | | K | | 2 |
| | 3LF4 | | | | | E | | | | | | |
| 1R5 | 1LA6 | | | | | E | F | | | | | 11 |
| | 1LC6 | | | | | E | F | | | | | 11 |
| | 1L6 | | | | D | | F | | | | | 11 |
| | 1A7G | | | | | E | F | | | | | 11 |
| 1S4 | 1A5GT | | | C | | E | | | | K | | 2 |
| | 1LA4 | | | C | | E | | | | K | | 2 |
| | 1LB4 | | | C | | E | | | | K | | 2 |
| | 1Q5GT | | | | | E | | | | K | | |
| | 1W4 | | | C | D | | | | | K | | 2 |
| | 3Q4 | | | | D | | | | | K | | |
| | 3Q5GT | | | | | E | | | | K | | |
| | 3S4 | | | | D | | | | | | | |
| | 3V4 | | | | D | | | | | K | | |
| 1S5 | 1L4 | | | | D | | | | | | | 5 |
| | 1LD5 | | | | | E | | | | | | 6 |
| | 1T4 | | | | D | | | | | K | | 5 |
| | 1U4 | | | | D | | | | | K | | 5 |
| | 3A8GT | | | C | | E | | G | | | | |
| 1T4 | 1L4 | | | | | | F | | | | | 1 |
| | 1LN5 | | | | | E | | | | | | 1–7 |
| | 1LC5 | | | | | E | | | | | | 1–6 |
| | 1P5GT | | | | | E | | G | | | | 7 |
| | 1U4 | | | | | | | | | | | 1 |
| | 5910 | | | | | | | | | | | 1 |
| 1T5GT | 1A5GT | | | | | | | | | K | | 2 |
| | 1Q5GT | | | C | | | | | | K | | 2 |
| | 1C5GT | | | C | | | | | | K | | 2 |
| | 1D8GT | | | C | | | | | | K | | 9 |
| | 1LA4 | | | | | E | | | | K | | 2 |
| | 1LB4 | | | | | E | | | | K | | |
| | 3D6 | | | | | E | | | | K | | 2 |
| | 3LF4 | | | | | E | | | | K | | 2 |
| 1U4 | 1L4 | | | | | | F | | | | | |
| | 1T4 | | | | | | F | | | | | 10 |
| | 1AF4 | | | C | | | F | | | | | |
| 3A8GT | 1LH4 | Requires room for two sockets no single replacement H | | | | | | | | | | |
| | 1LN5 | | | | | | | | | | | |
| | 1H5G | Requires room for two sockets no single replacement H | | | | | | | | | | |
| | 1N5G | | | | | | | | | | | |
| | 1C3 | Adaptor with 2 Min. sockets | | | | | | | | K | | 5 |
| | 1L4 | | | | | | | | | K | | |
| | 1C3 | Adaptor with 2 Min. sockets | | | | | | | | K | | |
| | 1S5 | | | | | | | | | K | | |

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | NO CHANGES | FIL. VOLTS | FIL. CURRENT | REWIRE SOCKET | CHANGE SOCKET | REALIGN | CHANGE BIAS OR PLATE VOLTS | REMOVE OR ADD CONNECTION | REMOVE OR ADD TOP CAP CONNECTION | CHANGE BIAS OR PLATE VOLTS | NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | H | K | | |
| 3LF4 | 3V4 | | | | | E | | | | | | |
| | 3Q4 | | | | | E | | | | | | |
| | 3S4 | | | | | E | | | | K | | 10 |
| | 3Q5GT | | | | | E | | | | | | |
| 3Q5GT (At 1.4 Volts only) | 1Q5GT | | | | D | | | | | | | |
| | 1C5GT | | | | D | | | | | K | | |
| | 1T5GT | | | | D | | | | | K | | 2 |
| | 3D6 | | | C | | E | | | | | | |
| | 1A5GT | | | C | D | | | | | K | | 2 |
| | 1D8GT | | | | D | | | | | K | | 9–2 |
| | 1LA4 | | | C | | E | | | | K | | 2 |
| | 1LB4 | | | C | | E | | | | K | | 2 |
| | 1W4 | | | C | | E | | | | K | | |
| | 1S4 | | | | | E | | | | K | | |
| | 3A4 | | | C | | E | | | | K | | |
| (At any Volt.) | 3B5GT | | | | | | | | | K | | |
| | 3LF4 | | | | | E | | | | | | |
| | 3Q4 | | | | | E | | | | | | 2 |
| | 3S4 | | | | | E | | | | K | | 6 |
| | 3V4 | | | | | E | | | | | | 2 |
| 3Q4 | 3V4 | | | | D | | | | | | | |
| | 3S4 | | | | | | | | | K | | |
| 3S4 (At 1.4 Volts only) | 1W4 | | | C | D | | | | | K | | |
| | 3A4 | | | C | D | | | | | K | | |
| | 1Q5GT | | | | | E | | | | K | | 7 |
| | 1S4 | | | | D | | | | | | | |
| | 3D6 | | | C | | E | | | | K | | |
| | 1C5GT | | | | | E | | | | | | 7 |
| | 1LB4 | | | C | | E | | | | K | | 2–7 |
| (At any Volt.) | 3Q4 | | | | | | | | | K | | 7 |
| | 3LF4 | | | | | E | | | | K | | |
| | 3Q5GT | | | | | E | | | | K | | 7 |
| | 3V4 | | | | | | | | | K | | 7 |
| 3V4 | 3Q4 | | | | D | | | | | K | | |
| | 3S4 | | | | D | | | | | K | | 10 |
| 19 | 1J6G | | | | | E | | | | | | |
| | 1G6GT | | B | C | | E | | | | | | |
| 30 | 1H4G | | | | | E | | | | | | |
| | 1E4G | | B | C | | E | | | | K | | |
| | 1G4GT | | | | | E | | | | K | | |
| | 1LE3 | | B | C | | E | | | | K | | |
| 32 | 1B4 (P or T) | | | | | | F | | | | | |
| | 1E5G | | | | | E | F | | | | | |
| | 1LN5 | | B | C | | E | F | | H | K | | 7 |
| | 1LC5 | | B | C | | E | F | | H | K | | 6 |
| | 34 | | | | | | F | | | | | |
| | 1A4 (P or T) | | | | | | F | | | | | |
| 33 | 1F4 | | | C | | | | | | K | | 2 |
| | 1F5G | | | C | | E | | | | K | | 2 |
| | 1G5G | | | C | | E | | | | | | |
| | 1J5G | | | C | | E | | | | K | | 2 |
| | 1A5GT | | B | C | | E | | | | K | | 2 |
| | 1C5GT | | B | C | | E | | | | K | | |
| | 1Q5GT | | B | C | | E | | | | K | | |
| | 1T5GT | | B | C | | E | | | | K | | 2 |
| 34 | 1A4 (P or T) | | | | | | F | | | | | |
| | 1D5G (P or T) | | | | | E | F | | | | | |
| | 1P5GT | | B | C | | E | F | | | K | | |
| | 1B4 (P or T) | | | | | | F | | | | | 1 |
| | 32 | | | | | | F | | | | | 1 |
| | 1E5 (G or P) | | | | | E | F | | | | | 1 |

For 117 volt types sometimes used with Battery Types, see page 24.

The G, GT or GT/G Types may be used interchangeably when space permits.

## NOTES FOR BATTERY TYPES SUBSTITUTIONS

A. This is shown only when the tubes are directly interchangeable for all published ratings. Unusual operating conditions may require analysis.

B. This means that the filament voltage on the substitute tube is different from the required type. In most cases this can be allowed for by use of a small resistor to drop the voltage to that required. In some cases a complete change over of all tubes so as to use a new supply may be advisable. No listing is made for 2.0 volt tubes replacing 1.4 volt tubes because the additional battery and best circuit changes must be determined for each case.

C. Indicates that the filament current of the substitute tube differs from that of the required type. If all tubes are used directly from the battery this will affect battery life only, but in many cases a series resistor or ballast may have to be changed, adjusted, or shunted. If in series on an AC-DC set a substitute with no change in current is required.

D. Uses the same socket but pin connection is different. Watch out for tie points not used in the former tube which may be used in the substitute tube.

E. Requires a different type of socket. Watch out for tie points as in "D".

F. Realignment is recommended as good practice in all cases of RF and IF changes.

G. Provision must be made for connection to the top cap of the substitute tube which was not originally required.

H. The former top cap connection will have to be changed to connect to a base pin or to the side of the adapter when one is used.

K. Indicates that the substitute tube operates at a different bias for the applied plate voltage than the original tube. If some of the newer types are substituted good performance and improved battery life can be obtained by reducing the plate voltage to the rating of the new tube and applying its rated bias.

(1) The use of a sharp cut-off RF pentode in place of a remote cut-off tube may cause great distortion in locations where strong signals are available. If no other substitute is available all tubes on the A.V.C. system should be changed.

(2) The optimum load resistance for these types is more than 20% off. If tone is noticeably poor, transformer tap adjustment or a new transformer may be required.

(3) Requires addition of screen voltage, resistor and bypass condenser. Select resistor to give screen volts approximately equal to the actual plate volts.

(4) This type can be used as a triode by tying screen and suppressor to the plate.

(5) A type 1N34 crystal may be used in place of one diode section of the original tube.

(6) If voltage at screen is greater than rated value it should be reduced.

(7) Screen voltage may be increased for use with this type.

(8) Circuit for this substitution is given on last few pages of this booklet.

(9) Unused elements should be tied to negative filament.

(10) Decrease screen voltage when using this type.

(11) This converter substitution is tricky. Some experimentation may be required to find the best connection for each set. Adaptor circuits in the back of this book may help.

The G, GT, or GT/G types may be used interchangeably where space permits.

---

For details of changes indicated Refer to page 18

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | A NO CHANGES | B FIL. VOLTS | C FIL. CURRENT | D REWIRE SOCKET | E CHANGE SOCKET | F REALIGN | G ADD OR REMOVE CAP OR CONNECTION | H CHANGE BIAS OR PLATE VOLTS | K NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|
| 6D8G | 7A8 | | | | | E | F | | H | |
| | 14J7 | | B | | | E | F | | H | |
| | 14S7 | | B | | | E | F | | H | |
| | 14B8 | | B | | | E | F | | H | |
| | 12A8GT | | B | | | | F | | | |
| | 12K8GT | | B | | | | F | | | |
| | 25B8GT | | B | | D | | F | | | 11 |
| | For 300 ma. types see type 6A8G and for procedure see article on page 8. | | | | | | | | | |
| 6G6G | 12L8GT | | B | | D | | | | | |
| | 14A5 | | B | | | E | | | K | 2 |
| | 35A5 | | B | | | E | | | K | 2 |
| | 35L6GT | | B | | | | | | K | 2 |
| | 50A5 | | B | | | E | | | K | 2 |
| | 50L6GT | | B | | | | | | K | 2 |
| | 50C6G | | B | | | | | | K | 2 |
| | For 300 ma. types see type 12A5 and for procedure see article on page 8. | | | | | | | | | |
| 6L5G | 12J5GT | | B | | | | | | | |
| | 14A4 | | B | | | E | | | | |
| | 14E6 | | B | | | E | | | | 9 |
| | 12J7GT | | B | | D | | | G | | 4 |
| | 12SJ7GT | | B | | D | | | | | 4 |
| | 7C7 | | | | | E | | | | 4 |
| | 14C7 | | B | | | E | | | | 4 |
| | 6W7G | | | | D | | | G | | 4 |
| | For 300 ma. types see type 6C5G and for procedure see article on page 8. | | | | | | | | | |
| 6S7G | 6SS7 | | | | D | | F | | H | |
| | 12SK7GT | | B | | D | | F | | H | |
| | 12K7GT | | B | | | | F | | | |
| | 7B7 | | | | | E | F | | H | 6 |
| | 14A7/12B7 | | B | | | E | F | | H | 6 |
| | 14E7 | | B | | | E | F | | H | |
| | 14H7 | | B | | | E | F | | H | 6 |
| | 12J7GT | | B | | | | F | | | 1 |
| | 12SJ7GT | | B | | D | | F | | H | 1 |
| | 7C7 | | | | | E | F | | H | 1 |
| | 14C7 | | B | | | E | F | | H | 1–6 |
| | For 300 ma. types see type 6K7G and for procedure see article on page 8. | | | | | | | | | |
| 6T7G | 12Q7GT | | B | | | | | | | |
| | 12SQ7GT | | B | | D | | | | H | |
| | 7C6 | | | | | E | | | H | |
| | 14B6 | | B | | | E | | | H | |
| | 14E7 | | B | | | E | | | H | 3 |
| | 14R7 | | B | | | E | | | H | 3 |
| | 12SF7 | | B | | D | | | | H | 3 |
| | 12C8 | | B | | D | | | | | 3 |
| | For 300 ma. types see type 6Q7GT and for procedure see article on page 8. | | | | | | | | | |
| 6W7G | 12J7GT | | B | | | | F | | | |
| | 12SJ7GT | | B | | D | | F | | H | |
| | 12SH7 | | B | | D | | F | | H | 6 |
| | 7C7 | | | | | E | F | | H | |
| | 14C7 | | B | | | E | F | | H | |
| | 12C8 | | B | | D | | F | | | 9 |
| | 14R7 | | B | | | E | F | | H | 9 |
| | For 300 ma. types see 6J7GT and for procedure see article on page 8. | | | | | | | | | |
| | For use as audio amplifiers types under 6S7G may also be used. | | | | | | | | | |
| 7A6 | 12AL5 | | B | | | E | | | | |
| | 12H6G | | B | | | E | | | | |
| | 14F7 | | B | | D | | | | | 4 |
| | 12SL7GT | | B | | | E | | | | 4 |

For details of changes indicated Refer to page 18

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | A NO CHANGES | B FIL. VOLTS | C FIL. CURRENT | D REWIRE SOCKET | E CHANGE SOCKET | F REALIGN | G ADD OR REMOVE CAP OR CONNECTION | H CHANGE BIAS OR PLATE VOLTS | K NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|
| 7A6 (Continued) | XXD | | B | | D | | | | | 4 |
| | 14AF7 | | B | | D | | | | | 4 |
| | 5679 | | | | D | | | | | |
| | For 300 ma. types see 6H6GT and for procedure see article on page 8. | | | | | | | | | |
| 7A8 | 14B8 | | B | | | | F | | | |
| | 14J7 | | B | | | | F | | | |
| | 14S7 | | B | | | | F | | | |
| | 12A8GT | | B | | | | F | G | | |
| | 12K8GT | | B | | | | F | G | | |
| | 6D8G | | | | | E | F | G | | |
| | 25B8GT | | B | | | E | F | G | | 11 |
| | For 300 ma. types see 6A8GT and for procedure see article on page 8. | | | | | | | | | |
| 7B7 | 7AH7 | | | | | | F | | K | |
| | 14A7/12B7 | | B | | | | F | | | |
| | 14H7 | | B | | | | F | | | 6 |
| | 6BJ6 | | | | | E | F | | K | |
| | 6S7G | | | | | E | F | G | | |
| | 6SS7 | | | | | E | F | | | |
| | 12SG7 | | B | | | E | F | | | 6 |
| | 12SK7G | | B | | | E | F | | | |
| | 12K7GT | | B | | | E | F | G | | |
| | 5590 | | | | | E | F | | | |
| | 9001 | | | | | E | F | | | |
| | For 300 ma. types see 6K7GT and for procedure see article on page 8. See also types under 7C7 and note 1. | | | | | | | | | |
| 7C6 | 6AQ6 | | | | | E | | | | |
| | 6SZ7 | | | | | E | | | | |
| | 6T7G | | | | | E | | G | | |
| | 12AX7 | | B | | | E | | | | 5 |
| | 12BK6 | | B | | | E | | | | |
| | 12BT6 | | B | | | E | | | | |
| | 12F5GT | | B | | | E | | G | | 5 |
| | 12Q7GT | | B | | | E | | G | | |
| | 12SF5GT | | B | | | E | | | | 5 |
| | 12SQ7GT | | B | | | E | | | | |
| | 14B6 | | B | | | | | | | |
| | For 300 ma. types see 6Q7GT and for procedure see article on page 8. | | | | | | | | | |
| 7C7 | 6BH6 | | | | | E | F | | K | |
| | 6W7G | | | | | E | | G | | |
| | 7AB7 | | | | D | | F | | | |
| | 7AG7 | | | | | | F | | K | |
| | 12AU6 | | B | | | E | F | | K | |
| | 12C8 | | B | | | E | | G | | 9 |
| | 12J7GT | | B | | | E | | G | | |
| | 12SH7G | | B | | | E | | | | 6 |
| | 12SJ7GT | | B | | | E | | | | |
| | 14C7 | | B | | | | | | | |
| | 14R7 | | B | | D | | | | | 9 |
| | 5879 | | | | | E | F | | K | |
| | For 300 ma. types see 6J7GT and for procedure see article on page 8. | | | | | | | | | |
| | For use in audio amplifiers types under 7B7 may also be used. | | | | | | | | | |
| 12A8GT | 7A8 | | B | | | E | F | | H | 8 |
| | 12K8GT | | | | | | F | | | 11 |
| | 6D8G | | B | | | | F | | | 11 |
| | 14B8 | | | | | E | F | | H | 8 |
| | 14J7 | | | | | E | F | | H | 8 |
| | 14S7 | | | | | E | F | | H | 8 |
| | 25B8GT | | B | | | E | F | | | 8 |
| | For 300 ma. types see 6A8GT and for procedure see article on page 8. | | | | | | | | | |

These substitutions are for AC-DC series sets. For transformer operated sets the above substitutions are possible if tubes requiring no voltage change are used. Substitutes from either the 150 or 300 ma. chart may be used.

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | NO CHANGES | FIL. VOLTS | FIL. CURRENT | REWIRE SOCKET | CHANGE SOCKET | REALIGN | ADD TOP CAP CONNECTION | REMOVE TOP CAP CONNECTION OR PLATE TOP | CHANGE BIAS VOLTS | NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | For details of changes indicated Refer to page 18 | A | B | C | D | E | F | G | H | K | |
| 12BA6 | 6BJ6 | | B | | D | | F | | | | |
| | 7AH7 | | B | | | E | F | | | K | |
| | 12BD6 | | | | | | F | | | K | |
| | 12SG7 | | | | | E | F | | | K | |
| | 12K7GT | | | | | E | F | G | | K | |
| | 12SK7GT | | | | | E | F | | | K | |
| | 14A7 | | | | | E | F | | | K | |
| | 14H7 | | | | | E | F | | | K | |
| 12BE6 | 6D8G | | B | | | E | F | G | | | 11 |
| | 12BA7 | | | | | E | F | | | | |
| | 12K8GT | | | | | E | F | G | | | 11 |
| | 12SA7GT | | | | | E | F | | | | |
| | 12SY7 | | | | | E | F | | | | |
| | 14B8 | | | | | E | F | | | | 11 |
| | 14J7 | | | | | E | F | | | | 11 |
| | 14Q7 | | | | | E | F | | | | |
| | 14S7 | | | | | E | F | | | | 11 |
| 12C8 | 12SF7 | | | | D | | F | | H | K | |
| | 14E7 | | | | | E | F | | H | | |
| | 14R7 | | | | | E | F | | H | K | |
| | For 300 ma. types see 6B8G and for procedure see article on page 8. | | | | | | | | | | |
| 12F5GT | 6T7G | | B | | D | | | | | | 9 |
| | 7C6 | | B | | | E | | | H | | 9 |
| | 12SF5GT | | | | D | | | | H | | |
| | 12SL7GT | | | | D | | | | H | | 9 |
| | 12Q7GT | | | | D | | | | | | 9 |
| | 12SQ7GT | | | | D | | | | H | | 9 |
| | 14B6 | | | | | E | | | H | | 9 |
| | For 300 ma. types see 6F5GT and for procedure see article on page 8. | | | | | | | | | | |
| 12J5GT | 6C4 | | B | | | E | | | | | |
| | 6L5G | | B | | | | | | | | |
| | 6W7G | | B | | D | | | G | | | 4 |
| | 7C7 | | B | | | E | | | | | 4 |
| | 12BF6 | | | | | E | | | | | 4 |
| | 12BU6 | | | | | E | | | | | 4 |
| | 12J7GT | | | | D | | | G | | | 4 |
| | 12SJ7GT | | | | D | | | | | | 4 |
| | 14A4 | | | | | E | | | | | |
| | 14C7 | | | | | E | | | | | 4 |
| | 14E6 | | | | | E | | | | | 9 |
| | 9002 | | B | | | E | | | | K | |
| | For 300 ma. types see 6J5GT and for procedure see article on page 8. | | | | | | | | | | |
| 12J7GT | 6BH6 | | B | | | E | F | G | | K | |
| | 6W7G | | B | | | | F | | | | |
| | 7AG7 | | B | | | E | F | G | | K | |
| | 7C7 | | B | | | E | F | | H | | 8 |
| | 12AU6 | | | | | E | F | G | | K | |
| | 12AW6 | | | | | E | F | G | | K | |
| | 12C8 | | | | D | | F | | | | 9 |
| | 12SH7G | | | | D | | F | | H | | 6 |
| | 12SJ7GT | | | | D | | F | | H | | |
| | 14C7 | | | | | E | F | | H | | 8 |
| | 14R7 | | | | | E | F | | H | | 9 |
| | 5879 | | B | | | E | F | G | | K | |
| | 9003 | | B | | | E | F | G | | K | |
| | For 300 ma. types see 6J7GT and for procedure see article on page 8. For use as audio amplifiers types under 12K7G may also be used. | | | | | | | | | | |
| 12K7GT | 6BJ6 | | B | | | E | F | | H | K | |
| | 6S7G | | B | | | | F | | | | |
| | 6SS7 | | B | | D | | F | | H | | |
| | 7AH7 | | B | | | E | F | | H | K | |

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | NO CHANGES | FIL. VOLTS | FIL. CURRENT | REWIRE SOCKET | CHANGE SOCKET | REALIGN | ADD TOP CAP CONNECTION | REMOVE TOP CAP CONNECTION OR PLATE TOP | CHANGE BIAS VOLTS | NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | For details of changes indicated Refer to page 18 | A | B | C | D | E | F | G | H | K | |
| 12K7GT (Continued) | 7B7 | | B | | | E | F | | H | | |
| | 12BA6 | | | | | E | F | | H | K | |
| | 12BD6 | | | | | E | F | | H | K | |
| | 12SG7 | | | | D | | F | | H | K | |
| | 12SK7G | | | | D | | F | | H | | |
| | 14A7/12B7 | | | | | E | F | | H | | 8 |
| | 14E7 | | | | | E | F | | H | | 9 |
| | 14H7 | | | | | E | F | | H | | 8–6 |
| | 25B8GT | | B | | D | | F | | | | 9 |
| | 5590 | | | | | E | F | | H | | |
| | 9001 | | | | | E | F | | H | K | |
| | For 300 ma. types see 6K7G and for procedure see article on page 8. See also types under 12J7GT and note 1. | | | | | | | | | | |
| 12K8GT | 7A8 | | B | | | E | F | | H | | 8 |
| | 12A8GT | | | | | | F | | | | 11 |
| | 14J7 | | | | | E | F | | H | | 8 |
| | 14S7 | | | | | E | F | | H | | 11 |
| | 6D8G | | B | | | | F | | | | 11 |
| | 25B8GT | | B | | D | | F | | | | 11 |
| | 14B8 | | | | | E | F | | H | | 8 |
| | For 300 ma. types see type 6K8G and for procedure see article on page 8. | | | | | | | | | | |
| 12Q7GT | 6AQ6 | | B | | | E | | | H | | |
| | 6T7G | | B | | | | | | | | |
| | 7B4 | | B | | | E | | | H | | 5 |
| | 7C6 | | B | | | E | | | H | | 8 |
| | 12AT6 | | | | | E | | | H | | |
| | 12AV6 | | | | | E | | | H | | |
| | 12BK6 | | | | | E | | | H | | |
| | 12BT6 | | | | | E | | | H | | |
| | 12F5GT | | | | D | | | | | | 5 |
| | 12SF5GT | | | | D | | | | H | | 5 |
| | 12SF7 | | | | D | | | | H | | 3 |
| | 12SQ7GT | | | | D | | | | H | | |
| | 14B6 | | | | | E | | | H | | 8 |
| | 14E7 | | | | | E | | | H | | |
| | 14R7 | | | | | E | | | H | | |
| | 14X7 | | | | | E | | | H | | |
| | For 300 ma. types see type 6Q7GT for procedure see article on page 8. | | | | | | | | | | |
| 12SA7GT | 6D8G | | B | | D | | F | G | | | 11 |
| | 7A8 | | B | | | E | F | | | | 11 |
| | 12A8GT | | | | D | | F | G | | | 11 |
| | 12K8GT | | | | D | | F | G | | | 11 |
| | 14B8 | | | | | E | F | | | | 11 |
| | 14J7 | | | | | E | F | | | | 11 |
| | 14Q7 | | | | | E | F | | | | 8 |
| | 14S7 | | | | | E | F | | | | 11 |
| | For 300 ma. types see type 6SA7 and for procedure see article on page 8. | | | | | | | | | | |
| 12SF5GT | 6T7G | | B | | D | | | G | | | |
| | 7C6 | | B | | | E | | | | | |
| | 12F5GT | | | | D | | | G | | | |
| | 12Q7GT | | | | D | | | G | | | |
| | 12SL7GT | | | | D | | | | | | |
| | 12SQ7GT | | | | D | | | | | | |
| | 14B6 | | | | | E | | | | | |
| | For 300 ma. types see type 6SF5 and for procedure see article on page 8. | | | | | | | | | | |
| 12SG7 | 6BJ6 | | B | | | E | F | | | | |
| | 7AH7 | | B | | | E | F | | | | |
| | 12BA6 | | | | | E | F | | | | |
| | 12BD6 | | | | | E | F | | | | |
| | 14H7 | | | | | E | F | | | | |

These substitutions are for AC-DC series sets. For transformer operated sets the above substitutions are possible if tubes requiring no voltage change are used. Substitutes from either the 150 or 300 ma. chart may be used.

For details of changes indicated Refer to page 18

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | A NO CHANGES | B FIL. VOLTS | C FIL. CURRENT | D REWIRE SOCKET | E CHANGE SOCKET | F REALIGN | G CHANGE BIAS OR PLATE VOLTS | H REMOVE TOP CAP CONNECTION | K ADD TOP CAP CONNECTION | NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 12SJ7GT | 6BH6 | | B | | | E | F | | | K | |
| | 6W7G | | B | | D | | F | G | | | |
| | 7AG7 | | B | | | E | F | | | K | |
| | 7C7 | | B | | | E | F | | | | 8 |
| | 12AU6 | | | | | E | F | | | K | |
| | 12AW6 | | | | | E | F | | | K | |
| | 12C8 | | | | D | | F | G | | | |
| | 12J7GT | | | | D | | F | G | | | |
| | 12SH7G | | | | D | | F | | | | 6 |
| | 14C7 | | | | | E | F | | | | 8 |
| | 14R7 | | | | | E | F | | | | |
| | 5879 | | | | | E | F | | | K | |
| | 9003 | | | | | E | F | | | | |
| | For use in audio amplifier types under 12SK7GT may also be used. | | | | | | | | | | |
| | For 300 ma. types see type 6SJ7G and for procedure see article on page 8. | | | | | | | | | | |
| 12SK7GT | 6BJ6 | | B | | | E | F | | | K | |
| | 6S7G | | B | | | | F | G | | | |
| | 6SS7 | | B | | | | F | | | | |
| | 7AH7 | | B | | | E | F | | | K | |
| | 7B7 | | B | | | E | F | | | | |
| | 12BA6 | | | | | E | F | | | K | |
| | 12B7/14A7 | | | | | E | F | | | | 8 |
| | 12BD6 | | | | | E | F | | | K | |
| | 12K7GT | | | | D | | F | G | | | |
| | 12SG7 | | | | D | | F | | | K | 6 |
| | 14E7 | | | | | E | F | | | | |
| | 14H7 | | | | | E | F | | | | 8 |
| | 5590 | | | | | E | F | | | | |
| | 9001 | | | | | E | F | | | K | |
| | See also types under 12SJ7 and note 1. | | | | | | | | | | |
| | For 300 ma. types see type 6K7G and for procedure see article on page 8. | | | | | | | | | | |
| 12SQ7GT | 6AQ6 | | B | | | E | | | | | |
| | 6T7G | | B | | D | | | G | | | |
| | 7B4 | | B | | | E | | | | | 5 |
| | 7C6 | | B | | | E | | | | | |
| | 12AT6 | | | | | E | | | | | |
| | 12AV6 | | | | | E | | | | | |
| | 12BK6 | | | | | E | | | | | |
| | 12BT6 | | | | | E | | | | | |
| | 12F5GT | | | | D | | | G | | | 5 |
| | 12Q7GT | | | | D | | | G | | | |
| | 12SF5GT | | | | D | | | | | | 5 |
| | 12SF7 | | | | D | | | | | | 3 |
| | 14B6 | | | | | E | | | | | 8 |
| | 14E7 | | | | | E | | | | | |
| | 14R7 | | | | | E | | | | | |
| | 14X7 | | | | | E | | | | | |
| | For 300 ma. types see type 6Q7GT and for procedure, see article on page 8. | | | | | | | | | | |
| 12SR7GT | 6C4 | | B | | | E | | | | | 5 |
| | 6L5G | | B | | D | | | | | | 5 |
| | 6ST7 | | B | | | | | | | | |
| | 12BF6 | | | | | E | | | | | |
| | 12C8 | | | | | E | | G | | | 4 |
| | 12E5GT | | | | D | | | | | K | 5 |
| | 12SF7 | | | | | E | | | | | 4 |
| | 14E6 | | | | | E | | | | | |
| | For 300 ma. types see type 6R7G and for procedure see article on page 8. | | | | | | | | | | |
| 14A4 | 6L5G | | B | | | E | | | | | |
| | 6ST7 | | B | | | E | | | | | |
| | 12J5GT | | | | | E | | | | | |
| | 12SR7 | | | | | E | | | | | |
| | 14E6 | | | | D | | | | | | 9 |
| | For 300 ma. types see type 6J5G and for procedure see article on page 8. | | | | | | | | | | |
| 14A5 | 12A6 | | | | | E | | | | | |
| | 35A5 | | B | | | | | | | K | 2 |
| | 50A5 | | B | | | | | | | K | 2 |
| | 50C6G | | B | | | E | | | | K | 2 |
| | 6G6G | | B | | | E | | | | K | 2 |
| | 35L6GT | | B | | | E | | | | K | 2 |
| | 50L6GT | | B | | | E | | | | K | 2 |
| | For 300 ma. types see type 12A5 and for procedure see article on page 8. | | | | | | | | | | |
| 14A7 | 7B7 | | B | | | | F | | | | |
| | 14H7 | | | | | | F | | | | 6 |
| | 6S7G | | B | | | E | F | G | | | |
| | 6SS7 | | B | | | E | F | | | | |
| | 12SK7GT | | | | | E | F | | | | |
| | 12SG7 | | | | | E | F | | | | 6 |
| | 12K7GT | | | | | E | F | G | | | |
| | For 300 ma. types see type 6K7GT and for procedure see article on page 8. | | | | | | | | | | |
| 14B6 | 7C6 | | B | | | | | | | | |
| | 6T7G | | B | | | E | | G | | | |
| | 12C8 | | | | | E | | G | | | 3 |
| | 12Q7GT | | | | | E | | G | | | |
| | 12SF7 | | | | | E | | | | | 3 |
| | 12SQ7GT | | | | | E | | | | | |
| | For 300 ma. types see type 6Q7GT and for procedure see article on page 8. | | | | | | | | | | |
| 14B8 | 7A8 | | B | | | | F | | | | |
| | 14J7 | | | | | | F | | | | |
| | 14S7 | | | | | | F | | | | |
| | 12A8GT | | | | | E | F | G | | | |
| | 12K8GT | | | | | E | F | G | | | |
| | 25B8GT | | B | | | E | F | G | | | 11 |
| | 6D8G | | B | | | E | F | G | | | |
| | For 300 ma. types see type 6A8GT and for procedure see article on page 8. | | | | | | | | | | |
| 14C7 | 7C7 | | B | | | | | | | | |
| | 6W7G | | B | | | E | | G | | | |
| | 12SH7 | | | | | E | | | | | 6 |
| | 12SJ7GT | | | | | E | | | | | |
| | 12J7GT | | | | | E | | G | | | |
| | For use as audio amplifiers see also types under 14A7. | | | | | | | | | | |
| | For 300 ma. types see type 6J7GT and for procedure see article on page 8. | | | | | | | | | | |
| 14E6 | 6C4 | | B | | | E | | | | | 5 |
| | 6L5G | | B | | | E | | | | | 5 |
| | 6ST7 | | B | | | E | | | | | |
| | 12BF6 | | | | | E | | | | | |
| | 12C8 | | | | | E | | G | | | 4 |
| | 12E5GT | | | | | E | | | | K | 5 |
| | 12SF7 | | | | | E | | | | | 4 |
| | 12SR7 | | | | | E | | | | | |
| | For 300 ma. types see type 6V7G and for procedure see article on page 8. | | | | | | | | | | |
| 14J7 | 6D8G | | B | | | E | F | G | | | |
| | 7A8 | | B | | | | F | | | | |
| | 12A8GT | | | | | E | F | G | | | |
| | 12B8GT | | | | | E | F | G | | | |
| | 12K8GT | | | | | E | F | G | | | |
| | 14B8 | | | | | | F | | | | |
| | 14S7 | | | | | | F | | | | |
| | For 300 ma. types see type 6A8G and for procedure see article on page 8. | | | | | | | | | | |

**These substitutions are for AC-DC series sets. For transformer operated sets the above substitutions are possible if tubes requiring no voltage change are used. Substitutes from either the 150 or 300 ma. chart may be used.**

For details of changes indicated Refer to page 18

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | NO CHANGES | FIL. VOLTS | FIL. CURRENT | REWIRE SOCKET | CHANGE SOCKET | REALIGN | ADD TOP CAP CONNECTION | REMOVE TOP CAP CONNECTION OR PLATE | CHANGE BIAS VOLTS | NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | H | K | |
| 14Q7 | 6D8G | | B | | | E | F | G | | | 11 |
| | 7A8 | | B | | D | | F | | | | 11 |
| | 12A8GT | | | | | E | F | G | | | 11 |
| | 12BA7 | | | | | E | F | | | | |
| | 12BE6 | | | | | E | F | | | | |
| | 12K8GT* | | | | | E | F | G | | | 11 |
| | 12SA7GT* | | | | | E | F | | | | |
| | 12SY7 | | | | | E | F | | | | |
| | 14B8 | | | | D | | F | | | | 11 |
| | 12SY7 | | | | | E | F | | | | |
| | 14B8 | | | | D | | F | | | | 11 |
| | 14J7 | | | | D | | F | | | | 11 |
| | 14S7 | | | | D | | F | | | | 11 |
| | For 300 ma. types see type 6SA7 and for procedure see article on page 8. | | | | | | | | | | |
| 14R7 | 7B7 | | B | | D | | | | | | 5 |
| | 7C7 | | B | | D | | | | | | 5 |
| | 12C8 | | | | | E | | G | | K | |
| | 12SF7 | | | | | E | | | | K | |
| | 14A7 | | | | D | | | | | | 5 |
| | 14C7 | | | | D | | | | | | 5 |
| | 14E7 | | | | | | | | | K | |
| | 14H7 | | | | D | | | | | | 5 |
| | For 300 ma. types see type 6B8G and for procedure see article on page 8. | | | | | | | | | | |
| 25B8GT | No good single tube; Types 12SF5 and 12K7G together. | | | | | | | | | | |
| | 12B8GT | | B | C | | | F | | | | |
| | 6P7G | | B | C | D | | F | | | K | |
| | 6F7 | | B | C | | E | F | | | K | |
| | 12AT6 and 12BA6 — Use adaptor with 2 Min. Sockets | | | | | | F | | H | | 9 |
| | 12AV6 and 12BD6 — Use adaptor with 2 Min. Sockets | | | | | | F | | H | | 9 |
| | 12BK6 and 12BA6 — Use adaptor with 2 Min. Sockets | | | | | | F | | H | | 9 |
| | 12BT6 and 12BD6 — Use adaptor with 2 Min. Sockets | | | | | | F | | H | | 9 |
| 25D8GT | 12AT6 and 12BA6 — Use adaptor with 2 Min. Sockets | | | | | | F | | H | | 9 |
| | Others same as 25B8GT using one of the diodes. | | | | | | | | | | |
| 35A5 | 12A6 | | B | | | E | | | | K | 2 |
| | 14A5 | | B | | | | | | | K | 2 |
| | 50A5 | | B | | | | | | | | |
| | 35B5 | | | | | E | | | | | |
| | 50B5 | | B | | | E | | | | | |
| | 35C5 | | | | | E | | | | | |
| | 50C5 | | B | | | E | | | | | |
| | 50C6G | | B | | | E | | | | K | |
| | 35L6GT | | | | | E | | | | | |
| | 50L6GT | | B | | | E | | | | | |
| | 70L7GT | | B | | | E | | | | | 9 |
| | For 300 ma. types see type 25L6GT and for procedure see article on page 8. | | | | | | | | | | |
| 35L6GT | 12A6 | | B | | | | | | | K | 2 |
| | 14A5 | | B | | | E | | | | K | 2 |
| | 35A5 | | | | | E | | | | | 8 |
| | 50A5 | | B | | | E | | | | | |
| | 35B5 | | | | | E | | | | | |
| | 50B5 | | B | | | E | | | | | |
| | 35C5 | | | | | E | | | | | |
| | 50C5 | | B | | | E | | | | | |
| | 50C6G | | B | | | | | | | | |
| | 50L6GT | | B | | | | | | | | |
| | 70L7GT | | B | | D | | | | | | 9 |
| | For 300 ma. types see type 25L6GT and for procedure see article on page 8. | | | | | | | | | | |

For details of changes indicated Refer to page 18

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | NO CHANGES | FIL. VOLTS | FIL. CURRENT | REWIRE SOCKET | CHANGE SOCKET | REALIGN | ADD TOP CAP CONNECTION | REMOVE TOP CAP CONNECTION OR PLATE | CHANGE BIAS VOLTS | NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | H | K | |
| 35Y4 | 70L7GT | | B | | | E | | | | | 9–10 |
| | 35W4 | | | | | E | | | | | |
| | 50X6 | | B | | D | | | | | | 10 |
| | 50Y6GT | | B | | | E | | | | | 10 |
| | 35Z3 | | | | D | | | | | | 10 |
| | 35Z4GT | | | | | E | | | | | 10 |
| | 35Z5GT | | | | | E | | | | | |
| | 40Z5 | | B | | | E | | | | | 10 |
| | 45Z3 | | B | C | | E | | | | | 10 |
| | 45Z5GT | | B | | | E | | | | | |
| | 50Z7G | | B | | | E | | | | | |
| 35Z3 | 70L7GT | | B | | | E | | | | | 9 |
| | 35W4 | | | | | E | | | | | |
| | 35Y4 | | | | D | | | | | | |
| | 50Y6GT | | B | | | E | | | | | |
| | 35Z4GT | | | | | E | | | | | |
| | 35Z5GT | | | | | E | | | | | |
| | 40Z5 | | B | | | E | | | | | |
| | 45Z3 | | B | C | | E | | | | | |
| | 45Z5GT | | B | | | E | | | | | |
| | 50Z7GT | | B | | | E | | | | | |
| 35Z4GT | 70L7GT | | B | | D | | | | | | 9 |
| | 35W4 | | | | | E | | | | | |
| | 35Y4 | | | | | E | | | | | |
| | 50Y6GT | | B | | D | | | | | | |
| | 35Z3 | | | | | E | | | | | |
| | 35Z5GT | | | | D | | | | | | |
| | 40Z5 | | B | | | E | | | | | |
| | 45Z3 | | B | C | | E | | | | | |
| | 45Z5GT | | B | | D | | | | | | |
| | 50Z7GT | | B | | D | | | | | | |
| 35Z5GT | 70L7GT | | B | | | | | | | | 9–10 |
| | 35Y4 | | | | | E | | | | | |
| | 50Y6GT | | B | | D | | | | | | 10 |
| | 35Z3 | | | | | E | | | | | 8–10 |
| | 35Z4GT | | | | | | | | | | 10 |
| | 40Z5 | | B | | | | | | | | |
| | 45Z3 | | B | C | | E | | | | | 10 |
| | 45Z5GT | | B | | | | | | | | |
| | 50Z7GT | | B | | D | | | | | | |
| 45Z5GT | 70L7GT | | B | | D | | | | | | 10 |
| | 35Y4 | | B | | | E | | | | | |
| | 50Y6GT | | B | | D | | | | | | 10 |
| | 35Z3 | | B | | | E | | | | | 10 |
| | 35Z4GT | | B | | D | | | | | | 10 |
| | 35Z5GT | | B | | | | | | | | |
| | 40Z5 | A | | | | | | | | | |
| | 45Z3 | | | C | | E | | | | | 10 |
| | 50Z7GT | | B | | D | | | | | | 10 |
| 50A5 | 12A6 | | B | | | E | | | | K | |
| | 14A5 | | B | | | | | | | K | |
| | 35A5 | | B | | | | | | | | |
| | 50B5 | | | | D | | | | | | |
| | 50C5 | | | | D | | | | | | |
| | 50C6G | | | | | E | | | | | |
| | 35L6GT | | B | | | E | | | | | |
| | 50L6GT | | | | | E | | | | | |
| | 70L7GT | | B | | | E | | | | | 10 |
| | For 300 ma. types see type 25L6GT and for procedure see article on page 8. | | | | | | | | | | |
| 50B5 | 35B5 | | B | | | | | | | | |
| | 35C5 | | B | | D | | | | | | |
| | 50C5 | | | | D | | | | | | |

These substitutions are for AC-DC series sets. For transformer operated sets the above substitutions are possible if tubes requiring no voltage change are used. Substitutes from either the 150 or 300 ma. chart may be used.

For details of changes indicated Refer to page 18

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | NO CHANGES | FIL. VOLTS | FIL. CURRENT | REWIRE SOCKET | CHANGE SOCKET | REALIGN | ADD TOP CAP CONNECTION | REMOVE TOP CAP CONNECTION OR PLATE VOLTS | CHANGE BIAS | NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 50C6G | 12A6 | | | | B | | | | | K | |
| | 14A5 | | | | B | | | E | | K | |
| | 35A5 | | | | B | | | E | | K | |
| | 50A5 | | | | | | | E | | K | |
| | 35L6GT | | | | B | | | | | K | |
| | 50L6GT | | | | | | | | | K | |
| | 70L7GT | | | | B | | D | | | K | 10 |
| | **For 300 ma. types see type 25C6G and for procedure see article on page 8.** | | | | | | | | | | |
| 50L6GT | 12A6 | | | | B | | | | | K | 2 |
| | 14A5 | | | | B | | | E | | K | 2 |
| | 35A5 | | | | B | | | E | | | |
| | 50A5 | | | | | | | E | | | 8 |
| | 35B5 | | | | B | | | E | | | |
| | 50B5 | | | | | | | E | | | |
| | 35C5 | | | | B | | | E | | | |
| | 50C5 | | | | | | | E | | | |
| | 50C6G | | | | | | | | | K | |
| | 35L6GT | | | | B | | | | | | |
| | 70L7GT | | | | B | | D | | | | |
| | **For 300 ma. types see type 25L6GT and for procedure see article on page 8.** | | | | | | | | | | |
| 50X6 | 50Y6GT | | | | | | | E | | | |
| | 50Y7GT | | | | | | | E | | | |
| | 50Z7G | | | | | | | E | | | |
| | 117Z6GT | | | | B | C | | E | | | |
| | **See also types under 50Y6GT for use as a half wave rectifier.** | | | | | | | | | | |
| 50Y6GT | 117Z6GT | | | | B | C | | | | | 12 |
| | 50X6 | | | | | | | E | | | 10 |
| | 50Z7G | | | | | | D | | | | 12 |
| | 70L7G | | | | | | D | | | | 4 |
| | **For 300 ma. types see type 25Z6 and for procedure see article on page 8.** | | | | | | | | | | |
| | **When used as a half-wave rectifier the following will substitute, if load is not too great.** | | | | | | | | | | |
| | 35Z3 | | | | B | | | E | | | 12 |
| | 35Z4GT | | | | B | | D | | | | 12 |
| | 35Z5GT | | | | B | | D | | | | 12 |
| | 45Z5GT | | | | | | D | | | | 12 |
| | 35Y4 | | | | B | | | E | | | 12 |
| | 70L7GT | | | | B | | D | | | | 9 |
| | 117Z4GT | | | | B | C | D | | | | 12 |
| 50Z7G | 50Y6GT | | | | | | D | | | | 10 |
| | 70L7GT | | | | B | | D | | | | 4–10 |
| | 117Z6GT | | | | B | C | D | | | | 10 |
| | **See also type 50Y6GT above.** | | | | | | | | | | |
| 70L7GT | 70A7GT | | | | | | D | | | | |
| | 117P7GT | | | | B | C | D | | | K | 2 |
| | 117N7GT | | | | B | C | D | | | | 2 |
| | 117L7/M7GT | | | | B | C | D | | | | 2 |
| XXD | 14AF7 | | | A | | | | | | | |
| | 14F7 | | | | | | | | | K | |
| | 12SL7GT | | | | | | | E | | K | |
| | 12AH7GT | | | | | | | E | | | |
| | 12SC7 | | | | | | | E | | K | |

## NOTES FOR 150 MA., 300 MA., TRANSFORMER AND AUTO TYPES

A. This is shown only when the tubes are directly interchangeable for all published ratings. Unusual operating conditions may require analysis.

B. This means that the heater voltage on the substitute tube is different from the required type. In most cases this can be taken care of by changing or shorting out a section of the series resistor. In cases where the resistor is in the line cord this is difficult unless the total voltage can be increased enough to make a line resistor unnecessary.
In transformer and auto sets this indicates that a series resistor is required to drop the voltage to that required by the substitute tube.

C. Indicates that the heater current of the substitute tube is different from the desired tube and that parallel resistors must be used as explained in the article on Page 8.
In transformer and auto sets tubes requiring more current should be used cautiously to avoid overloading the filament circuit. When more than one substitution is required in the same set it is sometimes possible for one to require a lower current keeping the total the same.

D. In these cases the tube socket is the same but some rearrangement of the connections may be necessary. It may only be necessary to be sure that contacts connected to elements of the substitute tube which are not required in that circuit are not used as tie points.

E. Requires a different type of socket. Watch out for tie points as in "D".

F. Realignment is recommended as good practice in all cases of RF and IF tube changes.

G. Provision must be made for connection to the top cap of the substitute tube which was not originally required.

H. The former top-cap connection will have to be changed to connect to a base pin.

K. Indicates that the substitute tube operates at a different bias for the applied plate voltage than the original tubes. Self bias circuits give some automatic correction but this should be measured and changed if necessary to prevent early failures.

(1) The use of a sharp cut-off pentode in place of a remote cutoff tube may cause great distortion in locations when strong signals are available. If no other substitute can be found all tubes on the A.V.C. system should be changed.

(2) The optimum load resistance for these types is more than 20% off. If tone or volume is noticeably poor, transformer tap adjustment or a new transformer may be required.

(3) Requires addition of screen voltage, resistor and bypass condenser. Select resistor to give screen volts approximately equal to actual plate volts.

(4) This type can be used as a triode by tying screen and suppressor to the plate. As a rectifier tie all grids to plate.

(5) A type 1N34 crystal may be used in place of the diode section of the original tube.

(6) If voltage at screen is greater than rated value it should be reduced.

(7) Screen voltage may be increased for this type.

(8) Circuit for this substitution is given on last few pages of this booklet.

(9) Unused elements should be connected to chassis or cathode terminal.

(10) Pilot lamp may be omitted or provided for by other means.

(11) This converter substitution is tricky. Some experimentation may be required to find the best connection for each set. Adaptor circuits in the back of this book may help.

(12) Check load current to be sure it is within ratings of substitute tube.

**These substitutions are for AC-DC series sets. For transformer operated sets the above substitutions are possible if tubes requiring no voltage change are used. Substitutes from either the 150 or 300 ma. chart may be used.**

For details of changes indicated Refer to page 18

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | A NO CHANGES | B FIL. VOLTS | C FIL. CURRENT | D REWIRE SOCKET | E CHANGE SOCKET | F REALIGN | G ADD TOP CAP CONNECTION | H REMOVE TOP CAP CONNECTION OR PLATE TO CAP | K CHANGE BIAS VOLTS | NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1V | 12Z3 | | B | | | | | | | | |
| | 76 | | | | | E | | | | | 4 |
| | 37 | | | | | E | | | | | 4 |
| | 6J5GT | | | | | E | | | | | 4 |
| | 12A7 | | B | | | E | | | | | 9 |
| | 14Y4 | | B | | | E | | | | | |
| | Any type listed under 35Z3 in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.) | | | | | | | | | | |
| 6A7 | 6A8GT | | | | | E | F | | | | 8 |
| | 6AN7 | | | C | | E | | | | | |
| | 6J8G | | | | | E | F | | | | 8 |
| | 6K8GT | | | | | E | F | | | | 8 |
| | 7B8 | | | | | E | F | | | | |
| | 7J7 | | | | | E | F | | | | |
| | 7S7 | | | | | E | F | | | | |
| | Any type listed under 6D8G in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.) | | | | | | | | | | |
| 6A8G | 6J8G | | | | | | F | | | | |
| | 6K8GT | | | | | | F | | | | |
| | 6A7 | | | | | E | F | | | | 8 |
| | 7B8 | | | | | E | F | | | | 8 |
| | 7J7 | | | | | E | F | | | | 8 |
| | 7S7 | | | | | E | F | | | | |
| | 12B8GT | | B | | D | | F | | | | 8 |
| | Any type listed under 6D8G in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.) | | | | | | | | | | |
| 6AE5GT/G | 6C5GT | | | | | | | | | K | |
| | 6AF5G | | | | | | | | | K | |
| | 6J5GT | | | | | | | | | K | |
| | 6P5GT | | | | | | | | | K | |
| | 7A4 | | | | | E | | | | K | |
| | Any type listed under 6L5G in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.) See also type 25AC5GT. | | | | | | | | | | |
| 6AF5G | 6J5G | | | | | | | | | K | |
| | 6C5GT | | | | | | | | | K | |
| | 6P5GT | | | | | | | | | K | |
| | 7A4 | | | | | E | | | | K | |
| | 6AE5GT | | | | | | | | | K | |
| | 76 | | | | | E | | | | K | |
| 6B7 | 6B8G | | | | | E | | | | | |
| | 6SF7 | | | | | E | | | | K | |
| | 7E7 | | | | | E | | | | | |
| | 7R7 | | | | | E | | | | K | |
| | Any type listed under 12C8 in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.) | | | | | | | | | | |
| 6B8G | 6B7 | | | | | E | | | | | |
| | 6SF7 | | | | D | | | | | K | |
| | 7E7 | | | | | E | | | | | |
| | 7R7 | | | | | E | | | | K | |
| | Any type listed under 12C8 in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.) | | | | | | | | | | |
| 6BE6 | 6A8GT | | | | | E | F | G | | | 11 |
| | 7Q7 | | | | | E | F | | | | |
| | 6SA7GT | | | | | E | F | | | | |
| | 6AN7 | | | | | E | F | | | | 11 |
| | 6D8G | | | C | | E | F | G | | | 11 |
| | 6J8G | | | | | E | F | G | | | 11 |
| | 6K8GT | | | | | E | F | G | | | 11 |
| | 7A8 | | | | | E | F | | | | 11 |
| | 7B8 | | | | | E | F | | | | 11 |
| 6BE6 (Continued) | 7J7 | | | | | E | F | | | | 11 |
| | 6BA7 | | | | | E | F | | | | |
| | 12BE6 | | | B | C | | F | | | | |
| | 12SY7 | | | B | C | | E | F | | | |
| 6C5GT | 7A4 | | | | | E | | | | | 8 |
| | 6J5GT | | A | | | | | | | | |
| | 6AF5G | | | | | | | | | K | |
| | 76 | | | | | E | | | | K | |
| | 6P5GT | | | | | | | | | K | |
| | 37 | | | | | E | | | | K | |
| | 6AE5G | | | | | | | | | K | |
| | 6V7G | | | | | D | | | | K | |
| | 85 | | | | | E | | | | K | |
| | 6R7G | | | | | D | | G | | | |
| | 6SR7G | | | | | D | | | | | |
| | Any type listed under 6L5G in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.) | | | | | | | | | | |
| 6C6 | 77 | | | | | | F | | | | |
| | 6J7GT | | | | | E | F | | | | |
| | 6SH7GT | | | | | E | F | | H | | 6 |
| | 6SJ7GT | | | | | E | F | | H | | |
| | 7L7 | | | | | E | F | | H | | 6 |
| | 7H7 | | | | | E | F | | H | | 6 |
| | 7G7 | | | | | E | F | | H | | 6 |
| | 36 | | | | | E | F | | | | |
| | 6D7 | | | | | E | F | | | | |
| | Also types under 6D6, but see Note 1. Any types listed under 6W7G in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.) | | | | | | | | | | |
| 6D6 | 78 | | | | | | F | | | | |
| | 39/44 | | | | | E | F | | | | |
| | 6K7GT | | | | | E | F | | | | |
| | 6SK7GT | | | | | E | F | | H | | |
| | 6U7G | | | | | E | F | | | | |
| | 6SD7GT | | | | | E | F | | H | | 6 |
| | 6SG7 | | | | | E | F | | H | | 6 |
| | 7A7 | | | | | E | F | | H | | |
| | 6E7 | | | | | E | F | | | | |
| | Also types under 6C6, but see note 1. Any types listed under 6S7G in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.) | | | | | | | | | | |
| 6F5GT | 6K5GT | | | | | D | | | | | |
| | 6SF5GT | | | | | E | | | H | | |
| | 6SL7GT | | | | | D | | | | | 9 |
| | 6Q7GT | | | | | D | | | | | 9 |
| | 6SQ7GT | | | | | D | | | H | | 9 |
| | 75 | | | | | E | | | | | 9 |
| | 6B6G | | | | | D | | | | | 9 |
| | 6B8G | | | | | D | | | | | 3 |
| | 6SF7 | | | | | D | | | H | | 3 |
| | 6F7 | | | | | E | | | | | 3–9 |
| | 6P7G | | | | | D | | | | | 3–9 |
| | 6B7 | | | | | E | | | | | 3 |
| | 7B4 | | | | | E | | | | | 8 |
| | 7B6 | | | | | E | | | | | 8–9 |
| | Any type listed under 12F5G in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.) | | | | | | | | | | |
| 6F7 | 6F7S | | | | | | F | | | | |
| | 6P7G | | | | | E | F | | | | |
| | 12B8GT | | B | | | E | F | | | K | |
| | 25B8GT | | B | C | | E | F | | | K | |
| 6H6GT | 6C8G | | | | | D | | G | | | 4 |
| | 12A7 | | B | | D | | | G | | | 4 |

These substitutions are for AC-DC series sets. For transformer operated sets the above substitutions are possible if tubes requiring no voltage change are used. Substitutes from either the 150 or 300 ma. chart may be used.

For details of changes indicated Refer to page 18

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | NO CHANGES | FIL. VOLTS | FIL. CURRENT | REWIRE SOCKET | CHANGE SOCKET | REALIGN | ADD TOP CAP CONNECTION OR REMOVE TOP CAP CONNECTION | CHANGE BIAS OR PLATE VOLTS | NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|
| 6H6GT (Continued) | 7F7 | | | | | | E | | | 4 |
| | 14N7 | | | B | | | E | | | 4 |
| | 14Y4 | | | B | | | E | | | |
| | Any type listed under 7A6 in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.) | | | | | | | | | |
| 6J5GT | 6C5GT | | A | | | | | | | |
| | See also 6C5GT in this table. | | | | | | | | | |
| 6J7GT | 7L7 | | | | | | E | F | H | 6–8 |
| | 6SJ7GT | | | | D | | | F | H | |
| | 77 | | | | | | E | F | | |
| | 6C6 | | | | | | E | F | | |
| | 6SH7GT | | | | D | | | F | H | 6 |
| | 7H7 | | | | | | E | F | H | 6 |
| | Any type listed under 6W7G in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.) | | | | | | | | | |
| 6J8G | 6A8GT | | | | | | | F | | |
| | 6K8GT | | | | | | | F | | |
| | 6A7 | | | | | | E | F | | |
| | 7B8 | | | | | | E | F | H | 8 |
| | 7J7 | | | | | | E | F | H | 8 |
| | 7S7 | | | | | | E | F | H | 8 |
| | 6F7 | | | | | | E | F | | |
| | 6P7G | | | | | D | | F | | |
| | Any type listed under 6D8G in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.) | | | | | | | | | |
| 6K5GT | See 6F5GT | | | | | | | | | |
| 6K7GT | 7H7 | | | | | | E | F | H | 6–8 |
| | 6U7G | | | | | | | F | | |
| | 6SK7GT | | | | | D | | F | H | |
| | 39/44 | | | | | | E | F | | |
| | 78 | | | | | | E | F | | |
| | 6D6 | | | | | | E | F | | |
| | 36 | | | | | | E | F | | |
| | 6SG7 | | | | | D | | F | H | 6 |
| | 7A7 | | | | | | E | F | H | 8 |
| | Types under 6J7GT, but see note 1. Any type listed under 6S7G in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.) | | | | | | | | | |
| 6K8GT | 6J8G | | | | | | | F | | |
| | 6A8GT | | | | | | | F | | |
| | 6A7 | | | | | | E | F | | |
| | 7B8 | | | | | | E | F | | |
| | 7J7 | | | | | | E | F | | |
| | 7S7 | | | | | | E | F | | |
| | Any type listed under 6D8G in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.) | | | | | | | | | |
| 6P5GT | See 6C5GT—Bias change may not be required. | | | | | | | | | |
| 6P7G | 6F7 | | | | | | E | F | | |
| | 12B8GT | | | B | | D | | F | K | |
| | 25B8GT | | | B | C | D | | F | K | |
| 6Q7GT | 6B6G | | A | | | | | | | |
| | 6SQ7GT | | | | | D | | | H | |
| | 75 | | | | | | E | | | 8 |
| | 7B6 | | | | | | E | | H | 8 |
| | 7K7 | | | | | | E | | H | |
| | XXFM | | | | | | E | | H | |
| | 6B7 | | | | | | E | | | 3 |
| | 6B8G | | | | | D | | | | 3 |
| | 6SF7 | | | | | D | | | H | 3 |
| 6Q7GT (Continued) | 7E7 | | | | | | E | | H | 3 |
| | 7R7 | | | | | | E | | H | 3 |
| | Any type listed under 6T7G in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.) | | | | | | | | | |
| 6R7GT | 6V7G | | | | | | | | K | |
| | 85 | | | | | | E | | K | |
| | 6SR7GT | | | | | D | | | H | |
| | 6B7 | | | | | | E | | K | 4 |
| | 6B8G | | | | | D | | | K | 4 |
| | 6SF7 | | | | | D | | | H K | 4 |
| | 7E7 | | | | | | E | | H K | 4 |
| | 7R7 | | | | | | E | | H K | 4 |
| | 7E6 | | | | | | E | | H K | 4 |
| 6SA7GT | 6A8GT | | | | | D | | G | | 11 |
| | 6J8G | | | | | D | | G | | 11 |
| | 6K8GT | | | | | D | | G | | 11 |
| | 7B8 | | | | | | E | | | 11 |
| | 7Q7 | | | | | | E | | | 8 |
| | 7J7 | | | | | | E | | | 11 |
| | 7S7 | | | | | | E | | | 11 |
| | Any type listed under 12SA7GT in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.) | | | | | | | | | |
| 6SJ7GT | 7L7 | | | | | | E | F | | 6 |
| | 6J7GT | | | | | D | | F | G | |
| | 77 | | | | | | E | F | G | |
| | 6C6 | | | | | | E | F | G | |
| | 6SH7GT | | | | | D | | F | | 6 |
| | 7H7 | | | | | | E | F | | 6 |
| | 7C7 | | | | | C | | E | F | |
| | 7A7 | | | | | C | | E | F | |
| | 6AG5 | | | | | | E | F | | 6 |
| | 6W7G | | | | | C | D | F | G | |
| | 7AJ7 | | | | | | E | F | | |
| 6SK7GT | 6BJ6 | | | | | | E | F | | |
| | 6K7GT | | | | | D | | F | G | |
| | 78 | | | | | | E | F | G | |
| | 6D6 | | | | | | E | F | G | |
| | 7B7 | | | | | C | | E | F | |
| | 6U7G | | | | | D | | F | G | |
| | 7A7 | | | | | | E | F | | |
| | 6SG7GT | | | | | D | | F | | 6 |
| | 6S7G | | | | | C | D | F | G | |
| | 6SS7 | | | | | C | | F | | |
| | 6BJ6 | | | | | C | | E | F | |
| 6SQ7GT | 7B6 | | | | | | E | | | |
| | 7K7 | | | | | | E | | | |
| | 7X7 (XXFM) | | | | | | E | | | |
| | 75 | | | | | | E | | G | |
| | 6AT6 | | | | | | E | | | |
| | 6AV6 | | | | | | E | | | |
| | 6AW7GT | | | | | D | | | | |
| | 6B6G | | | | | | E | | G | |
| | 6BD7 | | | | | C | | E | | |
| | 6BK6 | | | | | | E | | | |
| | 6BT6 | | | | | | E | | | |
| | 6Q7GT | | | | | D | | | G | |
| | 6S8GT | | | | | D | | | | |
| | 6T7G | | | | | C | D | | G | |
| | 6T8 | | | | | C | | E | | |
| | 7C6 | | | | | C | | E | | |
| | 6SZ7 | | | | | C | | | | |
| | Also any triode like 6F5G plus one or two 1N34 crystals in place of the diodes. | | | | | | | | | |
| 6U7G | 6K7GT | | | | | | | F | | K |
| | 6SK7GT | | | | | D | | F | H | K |
| | 6SD7 | | | | | D | | F | H | 6 |

These substitutions are for AC-DC series sets. For transformer operated sets the above substitutions are possible if tubes requiring no voltage change are used. Substitutes from either the 150 or 300 ma. chart may be used.

For details of changes indicated Refer to page 18

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | A NO CHANGES | B FIL. VOLTS | C FIL. CURRENT | D REWIRE SOCKET | E CHANGE SOCKET | F REALIGN | G ADD TOP CAP CONNECTION | H REMOVE TOP CAP CONNECTION | K CHANGE BIAS OR PLATE VOLTS | NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6U7G (Continued) | 39/44 | | | | | E | F | | | | |
| | 78 | | | | | E | F | | | K | |
| | 6D6 | | | | | E | F | | | | |
| | 7A7 | | | | | E | F | | H | | |
| | 6B7 | | | | | E | F | | | | 9 |
| | 6B8G | | | | D | | F | | | | 9 |
| | 6SF7 | | | | D | | F | | H | K | 9 |
| | 6F7 | | | | | E | F | | | | 9 |
| | 6P7G | | | | D | | F | | | | 9 |
| | 12B8GT | | B | | D | | F | | | | 9 |
| | 36 | | | | | E | F | | | | |
| | Any type listed under 6S7G in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.) | | | | | | | | | | |
| 6V7G | 85 | | | | | E | | | | | |
| | See type 6R7G, Bias change may not be required | | | | | | | | | | |
| 12A5 | 25B6G | | B | | | E | | | | | 2 |
| | 38 | | B | | | E | | G | | K | 2 |
| | 25A6 | | B | | | E | | | | | |
| | 43 | | B | | | E | | | | | |
| | 14C5 | | | C | | E | | | | K | |
| | 25A7G | | B | | | E | | | | | |
| | 25L6GT | | B | | | E | | | | K | 2 |
| | 25C6G | | B | | | E | | | | K | 2 |
| | 25N6G | | B | | | E | | | | K | 2 |
| | 32L7GT | | B | | | E | | | | K | 2 |
| | 12A7 | | | | D | | | G | | K | 2 |
| | Any type listed under 6G6G in 150 ma. chart may be used with simple resistor changes. (See article on Page 8.) | | | | | | | | | | |
| 12A7 | 32L7GT | | B | | | E | | | H | K | 2 |
| | 25A7GT | | B | | | E | | | H | K | 2 |
| | Any type listed under 70L7GT in 150 ma. chart may be used with simple resistor changes. (See article on page 8.) | | | | | | | | | | |
| 12B8GT | 12AT6 and 12BA6 | Make adaptor with 2 min. sockets | | | | F | | | H | | 9 |
| | 12AV6 and 12BD6 | Make adaptor with 2 min. sockets | | | | F | | | H | | 9 |
| | 12BK6 and 12BA6 | Make adaptor with 2 min. sockets | | | | F | | | H | | 9 |
| | 12BT6 and 12BD6 | Make adaptor with 2 min. sockets | | | | F | | | H | | 9 |
| | 6F7 | | B | | | | | | | K | |
| | 6P7G | | B | | | | | | | K | |
| | 25B8GT | | B | C | | | | | | | |
| 12Z3 | 1V | | B | | | | | | | | |
| | 12A7 | | | | | E | | G | | | 4 |
| | 76 | | B | | | E | | | | | 4 |
| | 37 | | B | | | E | | | | | 4 |
| | 6J5G | | B | | | E | | | | | 4 |
| | 14Y4 | | | | | E | | | | | |
| | 28Z5 | | B | C | | E | | | | | |
| | Any type listed under 35Z3 in 150 ma. chart may be used with simple resistor changes. (See article on page 8.) | | | | | | | | | | |
| 25A6GT | 14C5 | | B | C | | E | | | | | 8 |
| | 25B6G | | | | | | | | | | 2 |
| | 25N6G | | | | | | | | | K | 2 |
| | 25L6GT | | | | | | | | | K | 2 |
| | 43 | | | | | E | | | | | |
| | 12A5 | | B | | | E | | | | | |
| | 38 | | B | | | E | | G | | K | 2–8 |
| | 25C6G | | | | | | | | | K | 2 |
| | 32L7GT | | B | | D | | | | | K | 9–2 |
| | 25A7GT | | | | D | | | | | | 9 |
| | 12A7 | | B | | | E | | G | | K | 9–2 |

For details of changes indicated Refer to page 18

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | A NO CHANGES | B FIL. VOLTS | C FIL. CURRENT | D REWIRE SOCKET | E CHANGE SOCKET | F REALIGN | G ADD TOP CAP CONNECTION | H REMOVE TOP CAP CONNECTION | K CHANGE BIAS OR PLATE VOLTS | NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 25A6GT (Continued) | Any type listed under 35A5 in 150 ma. chart may be used with simple resistor changed. (See article on page 8.) | | | | | | | | | | |
| 25A7GT | 12A7 | | B | | | E | | G | | K | 2 |
| | 32L7GT | | B | | | | | | | K | 2 |
| | Any type listed under 70L7GT on 150 ma. chart may be used with simple resistor changes. (See article on page 8.) | | | | | | | | | | |
| 25AC5GT | Same types as 25A6GT. (Driver no longer required.) | | | | | | | | | | |
| 25B6G | 25N6G | | | | | | | | | K | |
| | 25L6GT | | | | | | | | | K | |
| | 25C6G | | | | | | | | | K | |
| | 12A5 | | B | | | E | | | | | 2 |
| | 38 | | B | | | E | | G | | K | 2 |
| | 25A6GT | | | | | | | | | | 2 |
| | 25A7GT | | | | D | | | | | | 2–9 |
| | 12A7 | | B | | | E | | G | | K | 2–9 |
| | 25B5 | | | | | E | | | | K | |
| | 43 | | | | | E | | | | | 2 |
| | 32L7GT | | B | | D | | | | | K | 2–9 |
| | Any type listed under 35A5 in 150 ma. chart may be used with simple resistor changes. (See article on page 8.) | | | | | | | | | | |
| 25C6G | 25N6G | | | | | | | | | K | 2 |
| | 25L6GT | | | | | | | | | K | 2 |
| | 25A6GT | | | | | | | | | K | 2 |
| | 43 | | | | | E | | | | K | 2 |
| | 12A5 | | B | | | E | | | | K | 2 |
| | 38 | | B | | | E | | G | | | 2 |
| | 25B6G | | | | | | | | | K | 2 |
| | 32L7GT | | B | | D | | | | | K | 2–9 |
| | 25A7GT | | | | D | | | | | K | 2–9 |
| | 12A7 | | B | | | E | | G | | | 2–9 |
| | 25B5 | | | | | E | | | | K | 2 |
| | Any type listed under 35L6GT in 150 ma. chart may be used with simple resistor changes. (See article on page 8.) | | | | | | | | | | |
| 25L6GT | 14C5 | | B | C | | E | | | | | 8 |
| | 25N6G | | | | | | | | | K | |
| | 25A6GT | | | | | | | | | K | 2 |
| | 25B6G | | | | | | | | | K | |
| | 25C6G | | | | | | | | | K | 2 |
| | 43 | | | | | E | | | | K | 2–8 |
| | 12A5 | | B | | | E | | | | K | 2 |
| | 38 | | B | | | E | | G | | K | 2 |
| | 32L7GT | | B | | D | | | | | | 9 |
| | 25A7GT | | | | D | | | | | K | 2–9 |
| | 12A7 | | B | | | E | | G | | K | 2–9 |
| | 25B5 | | | | | E | | | | K | |
| | Any type listed under 35L6GT in 150 ma. chart may be used with simple resistor changes. (See article on page 8.) | | | | | | | | | | |
| 25Y5 | 25Z5 | A | | | | | | | | | |
| | 25Z6GT | | | | | E | | | | | |
| | 50Y6GT | | B | C | | E | | | | | |
| | 50Z7G | | B | C | | E | | | | | |
| | When used as a half-wave rectifier, add types under 12Z3. | | | | | | | | | | |
| 25Z5 | Same as 25Y5 above. | | | | | | | | | | |
| 25Z6GT | 25Z5 | | | | | E | | | | | 8 |
| | 25Y5 | | | | | E | | | | | |
| | 50Y6GT | | B | C | | | | | | | |
| | 50Z7G | | B | C | D | | | | | | |
| | When used as a half-wave rectifier add types under 12Z3. | | | | | | | | | | |

These substitutions are for AC-DC series sets. For transformer operated sets the above substitutions are possible if tubes requiring no voltage change are used. Substitutes from either the 150 or 300 ma. chart may be used.

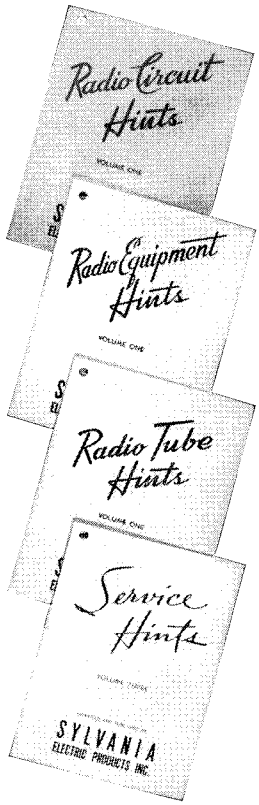
For details of changes indicated Refer to page 18

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | NO CHANGES | FIL. VOLTS | FIL. CURRENT | REWIRE SOCKET | CHANGE SOCKET | REALIGN | ADD TOP CAP CONNECTION | REMOVE TOP CAP CONNECTION | CHANGE BIAS OR PLATE VOLTS | NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | H | K | |
| 32L7GT | 25A7GT | | B | | | | | | | K | 2 |
| | 12A7 | | B | | | E | | G | | K | 2 |
| | 70L7GT | | B | C | D | | | | | K | |
| 36 | 6C6 | | | | | E | F | | | | 6 |
| | 77 | | | | | E | F | | | | 6 |
| | 6J7GT | | | | | E | F | | | | 6 |
| | 6SH7GT | | | | | E | F | | H | | 6 |
| | 6SJ7GT | | | | | E | F | | H | | 6 |
| | 7L7 | | | | | E | F | | H | | 6 |
| | 7H7 | | | | | E | F | | H | | 6 |
| | 7G7 | | | | | E | F | | H | | 6 |
| | Also types under 6D6, but see note 1. Any type listed under 6W7G in 150 ma. chart may be used with simple resistor changes. (See article on page 8.) | | | | | | | | | | |
| 37 | 76 | A | | | | | | | | | |
| | Also types shown under 6C5GT, add note E. | | | | | | | | | | |
| 38 | 12A7 | | | | | E | | | | | 9 |
| | Also types shown under type 12A5. | | | | | | | | | | |

For details of changes indicated Refer to page 18

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | NO CHANGES | FIL. VOLTS | FIL. CURRENT | REWIRE SOCKET | CHANGE SOCKET | REALIGN | ADD TOP CAP CONNECTION | REMOVE TOP CAP CONNECTION | CHANGE BIAS OR PLATE VOLTS | NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | H | K | |
| 39/44 | 78 | | | | | E | F | | | | |
| | 6D6 | | | | | E | F | | | | |
| | See also type 6D6. | | | | | | | | | | |
| 43 | 25A6GT | | | | | E | | | | | |
| | See also type 25A6GT and add note E. | | | | | | | | | | |
| 75 | 6Q7G | | | | | E | | | | | 8 |
| | See also type 6Q7G and add note E. | | | | | | | | | | |
| 76 | 37 | A | | | | | | | | | |
| | Also types shown under 6C5GT and add note E. | | | | | | | | | | |
| 77 | 6C6 | | | | | | F | | | | |
| | Also types under 6C6. | | | | | | | | | | |
| 78 | 6D6 | | | | | | F | | | | |
| | Also types under 6D6. | | | | | | | | | | |
| 85 | 6R7GT | | | | | E | | | | K | |
| | Also types under 6R7GT and add note E. | | | | | | | | | | |

# SYLVANIA REFERENCE BOOKS




**227**
**Radio Circuit Hints**

Handy reference on radio circuits, characteristics, — problems and quick solutions. **FREE**

**228**
**Radio Equipment Hints**

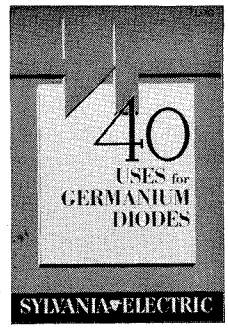
The most complete, handy booklet ever published on radio testing equipment, — how to build and use it. **FREE**

**226**
**Radio Tube Hints**

A condensed reference book of generally helpful information and data on radio tubes. **FREE**

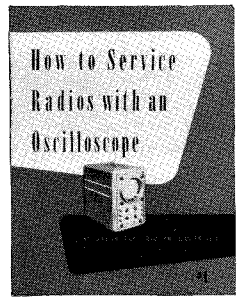
**208**
**Service Hints**

Up-to-date service tips on many makes of receivers. Advise on unusual service problems. **FREE**




**240**
**40 Uses for Germanium Diodes**

Here's the most complete collection of uses for germanium diodes ever published. Includes radio and television receiver circuits, transmitter circuits, many test and control circuits and dozens of plans for handy electronic gadgets.
**$1.00**




**218**
**How to Service Radios with an Oscilloscope**

Complete 72-page book that gives you step-by-step instructions for using the oscilloscope in testing and servicing radio receivers, audio amplifiers and transmitters. Thoroughly illustrated, and written in a language that you (and we) can understand. Makes your work more interesting and accurate.
**$1.00**

## ORDER FROM YOUR SYLVANIA DISTRIBUTOR

**These substitutions are for AC-DC series sets. For transformer operated sets the above substitutions are possible if tubes requiring no voltage change are used. Substitutes from either the 150 or 300 ma. chart may be used.**

For details of changes indicated Refer to page 18

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | NO CHANGES | FIL. VOLTS | FIL. CURRENT | REWIRE SOCKET | CHANGE SOCKET | REALIGN | ADD TOP CAP CONNECTION | REMOVE TOP CAP CONNECTION | CHANGE BIAS OR PLATE VOLTS | NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | H | K | |
| OZ4 (G) | 84 | | B | | | E | | | | | |
| | 6X5 | | B | | D | | | | | | |
| | | | | | | (Sometimes already wired) | | | | | |
| | 7Y4 | | B | | | E | | | | | |
| 2A3 | 2A5 | | | | | E | | | | K | |
| | 59 | | | | | E | | | | K | |
| | 47 | | | | | E | | | | K | |
| | 46 | | | | | E | | | | K | |
| 2A5 | 47 | | | | | E | | | | K | |
| | 59 | | | | | E | | | | K | |
| 2A6 | 2B7 | | | | | E | | | | | 3 |
| 5U4G | 5X4G | | | | D | | | | | | |
| | 83 | | | | | E | | | | | |
| | 83V | | | | | E | | | | | |
| | 5V4G | | | | D | | | | | | |
| 5V4G | 83V (See also type 83) | | | | | E | | | | | |
| 5W4G | 5Y3G | A | | | | | | | | | |
| | 80 | | | | | E | | | | | |
| | 5Y4G | | | | D | | | | | | |
| | 5Z4 | | | | D | | | | | | |
| 5X4G | 5U4G | | | | D | | | | | | |
| | 83 | | | | | E | | | | | |
| | 83V | | | | | E | | | | | |
| | 5Z3 | | | | | E | | | | | |
| 5Y3G | 5AZ4 | | | | | E | | | | | |
| | 5V4G | | | | D | | | | | | |
| | 5W4G | A | | | | | | | | | |
| | 5Z4 | | | | D | | | | | | |
| | 80 | | | | | E | | | | | |
| | 83V | | | | | E | | | | | |
| | 5Y4G | | | | D | | | | | | |
| 5Y4G | Same as 5Y3G above. (Add note D.) | | | | | | | | | | |
| 5Z3 | 5U4G | | | | | E | | | | | |
| | 5X4G | | | | | E | | | | | |
| | 83 | A | | | | | | | | | |
| | 83V | A | | | | | | | | | |
| 5Z4 | 5V4G | A | | | | | | | | | |
| | 5W4G | | | | D | | | | | | |
| | 5Y3G | A | | | | | | | | | |
| | 5Y4G | | | | D | | | | | | |
| | 80 | | | | | E | | | | | |
| | 83V | | | | | E | | | | | |
| 6A3 | 6A5G | | | | | E | | | | | |
| | 6B4G | | | | | E | | | | | |
| 6A5G | 6B4G | | | | D | | | | | | |
| | 6A3 | | | | | E | | | | | |
| 6A6 | 79 | | | | | E | | | | K | 2 |
| | 6N7G | | | | | E | | | | | |
| | 6Y7G | | | | | E | | | | K | 2 |
| | 6Z7G | | | | | E | | | | K | 2 |
| 6B4G | 6A3 | | | | | E | | | | | |
| | 6A5G | | | | D | | | | | | |
| 6B5 | 6N6G | | | | | E | | | | | |
| | 42 | | | | | | | | | K | |
| | 6F6 | | | | | E | | | | K | |
| | 41 | | | | | | | | | K | |
| | 7B5 | | | | | E | | | | K | |
| | 7C5 | | | | | E | | | | K | |
| 6F6G | 42 | | | | | E | | | | | 8 |
| | 41 | | | | | E | | | | K | 8 |
| | 7C5 | | | | | E | | | | K | 2 |
| | 7B5 | | | | | E | | | | K | |
| | 6B5 | | | | | E | | | | K | |
| 6F8G | 6C8G | | | | | | | | | K | |
| | 6N7G | | | | D | | | | | K | |
| | 6SN7GT | | | | D | | | | | | |
| | 7N7 | | | | | E | | | | | |
| 6K6GT | 6V6GT | | | C | | | | | | K | |
| | 6F6G | | | C | | | | | | K | |
| | 6U6GT | | | C | | | | | | K | |
| | 7A5 | | | C | | E | | | | K | |
| | 7B5 | | | | | E | | | | | |
| | 7C5 | | | C | | E | | | | K | |
| | 42 | | | C | | E | | | | K | 8 |
| | 41 | | | | | E | | | | | 8 |
| | 6B5 | | | C | | E | | | | K | |
| 6L6G | 6L6GA | A | | | | | | | | | |
| | 6AH5G | | | | D | | | | | | |
| | 6F6G | | | C | | | | | | K | 2 |
| | 42 | | | C | | E | | | | K | 2 |
| 6N6G | 6B5 | | | | | E | | | | | |
| | 42 | | | | | E | | | | K | |
| | 6F6 | | | | | | | | | K | |
| | 41 | | | | | E | | | | K | |
| | 7B5 | | | | | E | | | | K | |
| | 7C5 | | | | | E | | | | K | 2 |
| 6N7G | 6Y7G | | | | | | | | | | 2 |
| | 6Z7G | | | | | | | | | | 2 |
| | 6A6 | | | | | E | | | | | 2 |
| | 79 | | | | | E | | G | | | |
| 6U5/6G5 | 6E5 | A | | | | | | | | | |
| | 6AB5/6N5 | | | C | | | | | | | |
| | 2E5 | | B | C | | | | | | | |
| | 6T5 | A | | | | | | | | | |
| | 6H5 | A | | | | | | | | | |
| 6U6GT | See type 6K6GT | | | | | | | | | | |
| 6V6GT | See type 6K6GT | | | | | | | | | | |
| 6X5GT | 6ZY5G | | | C | | | | | | | 2 |
| | 84 | | | | | E | | | | | 8 |
| | 6Z5 | | | | D | | | | | | |
| | 7Y4 | | | | | E | | | | | 8 |
| | 6Y5 | | | C | | E | | | | | |
| 7B5 | 6V6GT | | | C | | E | | | | K | 2 |
| | 6K6GT | | | | | E | | | | | |
| | 6F6G | | | | | E | | | | K | |
| | 6U6GT | | | C | | E | | | | K | 2 |
| | 7C5 | | | C | | | | | | K | 2 |
| | 6B5 | | | C | | E | | | | K | |
| | 41 | | | | | E | | | | | |
| | 42 | | | | | E | | | | | |

See also 150 Ma. and 300 Ma. tables. Any type which does not require a voltage change may be used. Some types commonly used in television receivers are listed in the table starting on Page 26.

For details of changes indicated Refer to page 18

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | NO CHANGES | FIL. VOLTS | FIL. CURRENT | REWIRE SOCKET | CHANGE SOCKET | REALIGN | ADD TOP CAP CONNECTION | REMOVE TOP CAP CONNECTION | CHANGE BIAS OR PLATE VOLTS | NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | H | K | |
| 7C5 | 6V6GT | | | | | E | | | | | |
| | 6K6GT | | | C | | E | | | | K | 2 |
| | 6F6G | | | C | | E | | | | K | 2 |
| | 6U6GT | | | C | | E | | | | K | 2 |
| | 7B5 | | | C | | | | | | K | 2 |
| | 41 | | | C | | E | | | | K | 2 |
| | 42 | | | C | | E | | | | K | 2 |
| 7N7 | 6N7G | | | C | | E | | | | K | |
| | 6F8G | | | | | E | | | | | |
| | 6C8G | | | C | | E | | G | | K | |
| | 6SN7GT | | | | | E | | | | | |
| 12A | O1A | | | | | | | | | K | |
| 24A | 57 | | | C | | E | F | | | | |
| | 35 | | | | | | F | | | | |
| 26 | 27 | | B | C | | E | F | | | | |
| | 56 | | B | C | | E | F | | | | |
| 35/51 | 24 | | | | | | F | | | | 1 |
| | 58 | | | C | | | F | | | | |
| | 57 | | | C | | | F | | | | 1 |
| 41 | 42 | | | C | | | | | | K | |
| | 6K6G | | | C | | E | | | | | |
| | 6F6G | | | | | E | | | | | |
| | 6U6GT | | | C | | E | | | | K | 2 |
| | 6B5 | | | C | | | | | | K | |
| | 6N6G | | | C | | E | | | | K | |
| | 7A5 | | | C | | E | | | | K | 2 |
| | 7B5 | | | | | E | | | | | 8 |
| | 7C5 | | | C | | E | | | | K | |
| | 6V6GT | | | C | | E | | | | K | |
| 42 | 41 | | | C | | | | | | K | |
| | 6K6G | | | C | | E | | | | K | |
| | 6F6G | | | C | | E | | | | | |
| | 6U6GT | | | C | | E | | | | K | 2 |
| | 6B5 | | | C | | | | | | K | |
| | 6N6G | | | C | | E | | | | K | |
| | 7A5 | | | C | | E | | | | K | 2 |
| | 7B5 | | | C | | E | | | | K | 8 |
| | 7C5 | | | C | | E | | | | K | 2 |
| | 6V6GT | | | C | | E | | | | K | 2 |
| 45 | 2A3 | | | C | | | | | | K | |
| | 46 | | | C | | E | | | | K | |
| | 47 | | | C | | E | | | | K | |
| | 59 | | | C | | E | | | | K | |
| 46 | 47 | | | | | | | | | K | |
| | 59 | | | C | | E | | | | K | |
| 56 | 27 | | | C | | | | | | K | |
| 57 | 58 | | | | | | | | | K | |
| | 24A | | | C | | E | | | | | |
| | 35/51 | | | C | | E | | | | | |
| 58 | Same as 57. See note (1). | | | | | | | | | | |
| 59 | 46 | | | C | | E | | | | K | |
| | 47When used as pen. | | | C | | E | | | | K | |
| | 45When used as tri. | | | C | | E | | | | K | |
| 71A | 182B | | | C | | | | | | K | |
| | 183 | | | C | | | | | | K | |
| | 12A | | | | | | | | | K | |

For details of changes indicated Refer to page 18

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | NO CHANGES | FIL. VOLTS | FIL. CURRENT | REWIRE SOCKET | CHANGE SOCKET | REALIGN | ADD TOP CAP CONNECTION | REMOVE TOP CAP CONNECTION | CHANGE BIAS OR PLATE VOLTS | NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | H | K | |
| 80 | 5Y4G | | | | | E | | | | | |
| | 5Y3GT | | | | | E | | | | | |
| | 5W4GT | | | C | | E | | | | | |
| | 5Z4 | | | | | E | | | | | |
| | 5V4G | | | | | E | | | | | |
| | 83 | | | C | | | | | | | 2 |
| | 83V | | | | | | | | | | 2 |
| | 5Z3 | | | C | | | | | | | 2 |
| | 5X4G | | | C | | E | | | | | 2 |
| | 5U4G | | | C | | E | | | | | 2 |
| 83 | 83V | A | | | | | | | | | |
| | 5Z3 | A | | | | | | | | | |
| | 5X4G | | | | | E | | | | | |
| | 5U4G | | | | | E | | | | | |
| 84 | 6X5 | | | C | | E | | | | | |
| | 6Y5 | | | C | | | | | | | |
| | 6Z5 | | | C | | E | | | | | |
| | 6ZY5G | | | C | | E | | | | | |
| | 7Y4 | | | | | E | | | | | 8 |
| 89 | 89Y | A | | | | | | | | | |
| | 41 | | | | D | | | | | K | |
| | 6K6G | | | | | E | | | | K | |
| 117L7/M7GT | 117N7GT | | | | D | | | | | K | |
| | 117P7GT | | | | D | | | | | | |
| | 70L7GT | | B | C | D | | | | | K | 2 |
| | 70A7GT | | B | C | D | | | | | | 2 |
| 117N7GT | 117L7/M7GT | | | | D | | | | | K | 2 |
| | 117P7GT | | | | | | | | | K | |
| | 70L7GT | | B | C | D | | | | | K | 2 |
| | 70A7GT | | B | C | D | | | | | K | 2 |
| 117P7GT | 117L7/M7GT | | | | D | | | | | | |
| | 117N7GT | | | | | | | | | K | |
| | 70L7GT | | B | C | D | | | | | K | 2 |
| | 70A7GT | | B | C | D | | | | | K | 2 |
| 117Z6GT | 117L7/M7GT | | | C | D | | | | | | 4 |
| | 117N7GT | | | C | D | | | | | | 4 |
| | 70L7GT | | B | C | D | | | | | | 4 |
| | 117P7GT | | | C | D | | | | | | 4 |
| | 70A7GT | | B | C | D | | | | | | 4 |
| | 50Y6GT | | B | C | | | | | | | |
| | 50Z7G | | B | C | D | | | | | | |
| | When used as a half-wave rectifier, additional types may be found under 50Y6GT. | | | | | | | | | | |
| 182B/482B | 183/483 | | | | | | | | | K | |
| | 71A | | | C | | | | | | K | |
| | 45 | | B | | D | | | | | K | |
| | 46 | | B | | | E | | | | K | |
| | 2A3 | | B | | | | | | | K | |
| 183/483 | 182B/482B | | | | | | | | | K | |
| | 12A | | | C | | | | | | K | |
| | 45 | | B | | D | (Series Fil.) | | | | K | |
| | 46 | | B | | | E " " | | | | K | |
| | 2A3 | | B | | D | (Series Fil.) | | | | K | |
| 485 | 27 | | B | | | | | | | K | |
| | 56 | | B | | | | | | | K | |

See also 150 Ma. and 300 Ma. tables. Any type which does not require a voltage change may be used.
Some types commonly used in television receivers are listed in the table starting on page 26.

# TUBE SUBSTITUTIONS IN TELEVISION RECEIVERS

Many television receiver circuits demand tube performances beyond those required by standard broadcast receivers. New functions, higher frequencies and often higher voltages result in a very limited number of tube types suitable for most television receiver sockets. As a result, only the simplest of the substitutions listed are suggested for satisfactory performance. Even so, each receiver model should be considered individually with particular reference to the manufacturer's instruction manuals and servicing data. The following general comments on various functions may also be of aid in selecting a substitute type.

RF—CONVERTER—IF STAGES: The use of one higher or lower Gm tube in the RF or IF stages will not be likely to give trouble. If it causes oscillation which cannot be removed by alignment, the screen voltage may be lowered slightly. The effect of one low mutual conductance tube in the IF section probably would be negligible, but more than one would be almost certain to give noticeably poor results. Tubes with the same base, and if possible the same basing, should be selected, as any disturbance to the original wiring might make it difficult, if not impossible, to realign the stage properly. Where the substitute tube has a different value of screen current a change in the series screen resistor may be required.

DETECTORS: When diodes are used, very little trouble need be expected with any reasonable substitution. There are, however, receivers using duo-triodes with the other section of the tube possibly in a more critical circuit.

SYNC STRIPPERS AND SEPARATORS: These circuits depend on the correct matching of the tube characteristics if the applied signal is to give the exact magnitude and wave-shape required for the output. Changes in load resistors, bleeders, or input signal may be required for satisfactory operation of a substitute. An oscilloscope should be used to check for the proper wave form.

HORIZONTAL OSCILLATOR: In general, this is a very difficult circuit to readjust for a substitute tube. Since this tube is used in the AFC circuit any change in current or bias could completely upset the tuning adjustments.

HORIZONTAL OUTPUT: Since many of the suggested substitutions require the use of two tubes in parallel, trouble may be encountered due to parasitic oscillations. The addition of a 100-ohm resistor in each grid lead, a 50-ohm resistor in each screen lead, and the use of separate cathode resistors, each twice the value required for the original single tube, is generally effective in eliminating this difficulty. A 50-ohm resistor in each plate lead, close to the socket, may be required in a few cases.

VERTICAL OUTPUT: The usual difficulty with substitutions in this stage is obtaining linearity. This is largely due to a mismatch between tube and load. If the adjustment does not give a good picture, little can be done other than try another substitute.

DAMPER DIODES: These are critical in two ratings seldom considered seriously in the broadcast receiver. They are the peak inverse voltage rating, and, in some circuits, the maximum permissible heater - cathode voltage. Differences in the heater-cathode voltage rating can be taken care of by using an isolation transformer in the heater circuit, but the peak inverse rating can only be increased by adding tubes in series which is not practical. Damper tubes also require a high current rating making it difficult to find a suitable substitute.

HIGH VOLTAGE RECTIFIERS: There are at least three circuits commonly used in high voltage sections: (1) RF Oscillator, (2) Fly-back transformer, (3) Fly-back transformer with voltage-doubler. The peak inverse voltage requirements of the RF and fly-back type circuits are quite different from one another. Although it is possible to change from one system to another, a great deal of careful study of this circuit on the part of the serviceman is urged before such an alteration is attempted.

For details of changes indicated Refer to page 28

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | NO CHANGES | FIL. VOLTS | FIL. CURRENT | REWIRE SOCKET | CHANGE SOCKET | REALIGN | ADD TOP CAP CONNECTION | REMOVE TOP CAP CONNECTION | CHANGE BIAS OR PLATE VOLTS | NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | H | K | |
| 1B3GT | 1X2 (A) | | | | | E | | | | | 13 |
| | 1Y2 | | B | C | | E | | | | | |
| | 5642 | | | | | E | | | | | 13 |
| 1V2 | 1B3GT | | B | C | | E | | G | | | |
| | 1X2 (A) | | B | C | D | | | G | | | |
| | 5642 | | B | C | | E | | G | | | |
| | 1Y2 | | B | C | | E | | G | | | |
| 1X2 (A) | 1V2 | | B | C | D | | | | H | | 13 |
| | 5642 | | B | C | | E | | G | | | 13 |
| | 1B3GT | | | | | E | | | | | |
| 6AG5 | 6AK5 | | | C | | | F | | | K | |
| | 6BC5 | | | | | | F | | | | |
| | 6BH6 | | | C | | | F | | | | |
| | 6AU6 | | | | D | | F | | | | |
| | 6CB6 | | | | D | | F | | | | |
| | 6AS6 | | | C | D | | F | | | | |
| | 12AU6 | | B | C | D | | F | | | | |
| | 12AW6 | | B | C | D | | | | | | |
| | 5591 | | | C | | | F | | | K | |
| | 5654 | | | C | | | F | | | | |
| 6AK5 | 6AG5 | | | C | | | F | | | K | |
| | 6BC5 | | | C | | | F | | | K | |
| | 6BH6 | | | C | | | F | | | K | |
| | 6AU6 | | | C | | | F | | | K | |
| | 6CB6 | | | C | D | | F | | | | |
| | 6AS6 | | | | | | F | | | | |
| | 12AU6 | | B | C | | | F | | | K | |
| | 12AW6 | | B | C | D | | F | | | K | |
| | 5591 | | | C | | | F | | | | |
| | 5654 | | | | | | F | | | | |
| 6AL5 | 12AL5 | | B | C | | | | | | | |
| | 5726 | A | | | | | | | | | |
| | 6AQ7GT | | | | | E | | | | | 11 |
| | 6AW7GT | | | | | E | | | | | 11 |
| | 6BC7 | | | C | | E | | | | | |
| | 6H6GT | | | | | E | | | | | |
| | 7A6 | | | C | | E | | | | | |
| | 14A6 | | B | | | E | | | | | |
| | 12AT7 | | | | | E | | | | | 11 |
| | 12AU7 | | | | | E | | | | | 11 |
| | 12AV7 | | | | | E | | | | | 11 |
| | 12AX7 | | | | | E | | | | | 11 |
| | 12AY7 | | | | | E | | | | | 11 |
| | 1N34 | Use 2 if necessary. | | | | | | | | | |
| | 1N60 | Use 2 if necessary. | | | | | | | | | |
| 6AQ5 (when used as a pentode or triode) | 6AR5 | | | C | D | | | | | K | |
| | 5686 | | | C | | E | | | | | |
| | 6V6GT | | | | | E | | | | | |
| | 7C5 | | | | | E | | | | | |
| | 6BF5 | | | C | | | | | | | |
| | 6K6GT | | | C | | E | | | | K | |
| 6AQ5 (when used as a triode only) | 6SN7GT | | | C | | E | | | | K | 22 |
| | 6BF5 | | | C | | | | | | | 4 |
| | 6W6GT | | | | | E | | | | | 4 |
| | 6S4 | | | C | | E | | | | K | |
| | 12BH7 | | | C | | E | | | | K | 22 |
| 6AT6 | 6AQ6 | | | C | | | | | | | |
| | 6AQ7GT | | | | | E | | | | | |
| | 6AV6 | | | | | | | | | | |
| | 6AW7GT | | | | | E | | | | | |
| | 6B6G | | | | | E | | G | | | |
| | 6BD7 | | | C | | E | | | | | |
| | 6BK6 | A | | | | | | | | | |
| | 6BT6 | A | | | | | | | | | |

For details of changes indicated Refer to Page 28

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | NO CHANGES | FIL. VOLTS | FIL. CURRENT | REWIRE SOCKET | CHANGE SOCKET | REALIGN | ADD TOP CAP CONNECTION | REMOVE TOP CAP CONNECTION | CHANGE BIAS OR PLATE VOLTS | NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | H | K | |
| 6AU5GT | 6AV5GT | | | C | | | | | | | |
| | 6BG6G | | | C | D | | | G | | | |
| | 6BQ6GT | | | C | D | | | G | | | |
| | 6L6G (A) | | | C | D | | | | | | 23 |
| | 807 (W) | | | C | | E | | G | | | |
| | 6AL6G | | | C | D | | | G | | | |
| | 6AH5G | | | C | D | | | | | | |
| 6AU6 | Same as type 6AK5 | | | | | | | | | | |
| 6AV5GT | 6AU5GT | | | C | | | | | | | |
| | 6BG6G | | | C | D | | | G | | | |
| | 6BQ6GT | | | | D | | | G | | | |
| | 6L6G (A) | | | C | D | | | | | | 23 |
| | 6AL6G | | | C | D | | | G | | | |
| | 807 (W) | | | C | | E | | G | | | |
| | 6AH5G | | | C | D | | | | | | |
| 6BC5 | 6AG5 | | | | | | F | | | | |
| | 6AK5 | | | C | | | F | | | K | |
| | 6AU6 | | | | D | | F | | | | |
| | 6BH6 | | | C | D | | F | | | | |
| | 6CB6 | | | | D | | F | | | | |
| | 6SH7GT | | | | | E | F | | | | 15 |
| | 7AG7 | | | C | | E | F | | | | 15 |
| | 5654 | | | C | | | F | | | K | |
| | 5591 | | | C | | | F | | | K | |
| 6BD5GT | 6AU5GT | | | C | | | | | | K | 6 |
| | 6AV5GT | | | C | | | | | | K | 6 |
| | 6BG6G | | | | D | | | G | | K | 6 |
| | 6BQ6GT | | | C | D | | | G | | K | 6 |
| | 6L6G (A) | | | | D | | | | | | |
| | 807 (W) | | | | | E | | G | | K | 6 |
| 6BG6G | 6CD6G | | | C | | | F | | | | 10 |
| | 6BQ6GT | | | C | D | | F | | | | 10–14 |
| | 6AV5GT | | | C | D | | F | | | | |
| | 6AU5GT | | | C | D | | F | | | | |
| | 807 (W) | | | | | E | F | | | | |
| | 19BG6G | | B | C | | | F | | | | |
| | 25BQ6GT | | B | C | D | | F | | | | 14 |
| 6BQ6GT | 6BG6G | | | C | D | | F | | | | 7 |
| | 6CD6G | | | C | D | | F | | | | 7 |
| | 6AU5GT | | | | D | | F | | H | | |
| | 6AV5GT | | | | D | | F | | H | | |
| | 807 (W) | | | | | E | F | | | | 7 |
| | 19BG6G | | B | C | D | | F | | | | 7 |
| | 25BQ6GT | | B | C | | | F | | | | |
| 6CB6 | 6AK5 | | | C | D | | F | | | K | |
| | 6AG5 | | | | D | | F | | | | |
| | 6BC5 | | | | D | | F | | | | |
| | 6BH6 | | | C | | | F | | | | |
| | 6AU6 | | | | D | | F | | | | |
| | 6AS6 | | | C | | | F | | | K | |
| | 12AU6 | | B | C | D | | F | | | | |
| | 12AW6 | | B | C | | | F | | | | |
| | 5591 | | | C | D | | F | | | K | |
| | 5654 | | | C | D | | F | | | K | |
| 6CD6 | 6AU5GT | | | | | E | | G | | | 12 |
| | 6BQ6GT | | | C | | E | | G | | | 12 |
| | 807 (W) | | | C | | E | | G | | | 12 |
| | 19BG6G | | B | C | | E | | G | | | 12 |
| | 25BQ6GT | | B | C | | E | | G | | | 12 |
| | 6BG6G | | | C | | E | | G | | | 12 |
| | 6AV5GT | | | C | | E | | G | | | 12 |

These substitutions apply particularly for television sets but may be used anywhere providing all changes, particularly B and C are considered.

For details of changes indicated Refer to page 28

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | A NO CHANGES | B FIL. VOLTS | C FIL. CURRENT | D REWIRE SOCKET | E CHANGE SOCKET | F REALIGN | G ADD TOP CAP CONNECTION | H REMOVE TOP CAP CONNECTION | K CHANGE BIAS OR PLATE VOLTS | NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6J6 | 12AT7 | | | C | | E | F | | | | |
| | 12AU7 | | | C | | E | F | | | | 15 |
| | 12AV7 | | | | | E | F | | | | 15 |
| | 12AY7 | | | | | E | F | | | | 15 |
| | 19J6 | | B | C | | | F | | | | |
| | 5687 | | | | | E | F | | | K | |
| | 7F8 (W) | | | C | | E | F | | | | 15 |
| 6S4 | 6SN7GT | | | | | E | F | | | | 22 |
| | 6SN7WGT | | | | | E | F | | | | 22 |
| | 5692 | | | | | E | F | | | | 22 |
| | 6BL7GT | | | C | | E | F | | | | 22 |
| | 12BH7 | | | | D | | F | | | | 22 |
| | 7N7 | | | | | E | F | | | | 22 |
| | 6AQ5 | | | C | | E | F | | | | 4 |
| | 12SN7GT | | B | C | | E | F | | | | 22 |
| | 12SX7GT | | B | C | | E | F | | | | 22 |
| | 14N7 | | B | C | | E | F | | | | 22 |
| | 5687 | | | C | D | | F | | | | 22 |
| 6SL7GT | 2C52 | | B | | | | F | | | | |
| | 6C8G | | | | D | | F | G | | K | |
| | 6SL7WGT | | | | | | F | | | | |
| | 6SU7GTY | | | | | | F | | | | |
| | 7F7 | | | | | E | F | | | | |
| | 7F8 | | | | | E | F | | | K | |
| | 7F8W | | | | | E | F | | | K | |
| | 12AT7 | | | | | E | F | | | K | |
| | 12AV7 | | | C | | E | F | | | K | |
| | 12AX7 | | | | | E | F | | | | |
| | 12AY7 | | | | | E | F | | | K | |
| | 12SL7GT | | B | C | | | F | | | | |
| | 14F7 | | B | C | | E | F | | | | |
| | 14F8 | | B | C | | E | F | | | K | |
| | 5691 | | | C | | | F | | | | |
| | 5694 | | | C | D | | F | | | K | |
| 6SN7GT | 6SN7WGT | A | | | | | | | | | |
| | 6BL7GT | | | C | | | | | | | |
| | 5692 | A | | | | | | | | | |
| | 6AH7GT | | | C | D | | F | | | | |
| | 6F8G | | | | | | F | G | | | |
| | 7AF7 | | | C | | E | F | | | | |
| | 7N7 | | | | | E | F | | | | |
| | 12AH7GT | | B | C | D | | F | | | | |
| | 12AU7 | | | C | | E | F | | | | |
| | 12SN7GT | | B | C | | | F | | | | |
| | 12SX7GT | | B | C | | | F | | | | |
| | 14N7 | | B | C | | E | F | | | | |
| | 5687 | | | C | | E | F | | | K | |
| 6T8 | 6S8GT | | | C | | E | | G | | | |
| | 7K7 | | | C | | E | | | | | 5 |
| | 6AQ6 | | | C | | E | | | | | 5 |
| | 6AT6 | | | C | | E | | | | | 5 |
| | 6AV6 | | | C | | E | | | | | 5 |
| | 6BD7 | | | C | D | | | | | | 5 |
| | 6BK6 | | | C | | E | | | | | 5 |
| | 6BT6 | | | C | | E | | | | | 5 |
| | 7C6 | | | C | | E | | | | | 5 |
| | 19T8 | | B | C | | | | | | | |
| 6V6GT | 7C5 | | | | | E | | | | | |
| | 6BF5 | | | C | | | | | | | |
| | 6K6GT | | | C | | | | | | | |
| | 6AQ5 | | | | | E | | | | | |
| | 6W6GT | | | C | | | | | | | |
| | 6U6GT | | | C | | | | | | | |
| | 6F6GT | | | C | | | | | | | |
| | 41 | | | C | | E | | | | | |
| | 42 | | | C | | E | | | | | |

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | A NO CHANGES | B FIL. VOLTS | C FIL. CURRENT | D REWIRE SOCKET | E CHANGE SOCKET | F REALIGN | G ADD TOP CAP CONNECTION | H REMOVE TOP CAP CONNECTION | K CHANGE BIAS OR PLATE VOLTS | NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6W4GT | 6U4GT | A | | | | | | | | | |
| | 6BY5G | | | C | D | | | | | | 20 |
| | 6AX5GT | | | | D | | | | | | 20 |
| | 6AX6GT | | | C | D | | | | | | 20 |
| | 5V4G | | B | C | D | | | | | | 20–17 |
| | 25W4GT | | B | C | | | | | | | |
| | 6V4 | | | C | | E | | | | | 20 |
| | 7Z4 | | | C | | E | | | | | 20 |
| 6W6GT | 6V6GT | | | C | | | | | | | |
| | 7C5 | | | C | | E | | | | | |
| | 6BF5 | | | | | E | | | | | |
| | 6K6GT | | | C | | | | | | | |
| | 6AQ5 | | | C | | E | | | | | |
| (as a triode) | 6S4 | | | C | | E | | | | | |
| " " | 6BL7GT | | | C | D | | | | | | |
| 7F8 | 6SL7GT | | | | | E | F | | | K | 15 |
| | 5691 | | | C | | E | F | | | K | 15 |
| | 6SL7WGT | | | | | E | F | | | K | 15 |
| | 6SU7GTY | | | | | E | F | | | K | 15 |
| | 7F7 | | | | | | F | | | K | 15 |
| | 7F8W | A | | | | | F | | | | |
| | 12AT7 | | | | | E | F | | | | |
| | 12AV7 | | | C | | E | F | | | | 15 |
| | 6J6 | | | | | | | | | | 16 |
| | 6SL7W | | | | | E | F | | | K | 15 |
| | 12SL7GT | | B | C | | E | F | | | K | 15 |
| | 14F7 | | B | C | | | F | | | K | 15 |
| | 14F8 | | B | C | | | F | | | | |
| 12AT7 | 12AV7 | | | C | | | F | | | | 15 |
| any Voltage | 12AX7 | | | | | | F | | | K | 15 |
| 6.3 V. only | 6J6 | | | C | | E | F | | | | 16 |
| " " | 6SL7GT | | | | | E | F | | | K | 15 |
| " " | 6SL7WGT | | | | | E | F | | | K | 15 |
| " " | 6SU7GTY | | | | | E | F | | | K | 15 |
| " " | 7F8 | | | | | E | F | | | | |
| " " | 7F8W | | | | | E | F | | | | 15 |
| " " | 5691 | | | C | | E | F | | | K | 15 |
| " " | 5694 | | | C | | E | F | | | K | 15 |
| 12 V. only | 12SL7GT | | | | | E | F | | | K | 15 |
| " " | 14F8 | | | | | E | F | | | | |
| 12AU7 | 5692 | | | C | | E | F | | | | |
| 6 V. service | 5687 | | | C | D | | F | | | | |
| " " | 12AV7 | | | C | | | F | | | K | |
| " " | 6AH7GT | | | | | E | F | | | K | |
| " " | 6F8G | | | C | | E | F | | | | |
| " " | 6SN7GT | | | C | | E | F | | | | |
| " " | 7AF7 | | | | | E | F | | | | |
| " " | 7N7 | | | C | | E | F | | | | |
| 150 ma. service | 12AH7GT | | | | | E | F | | | | |
| 12AV7 | 12AT7 | | | C | | | | | | | |
| (at 6.3 volts) | 12AU7 | | | C | | | | | | | |
| " " | 2C51 | | | C | D | | | | | | |
| " " | 6BQ7 | | | C | D | | | | | K | |
| " " | 6C8G | | | C | | E | | | | | |
| " " | 6J6 | | | | | E | | | | | |
| " " | 5694 | | | C | | E | | | | | |
| (at 12 volts) | 12AT7 | | | C | | | | | | | |
| " " | 12AU7 | | | C | | | | | | | |
| 12AX7 | 6SC7GT | | | | | E | | | | | |
| (at 6.3 volts) | 6SL7GT | | | | | E | | | | | |
| " " | 6SU7GT | | | | | E | | | | | |
| " " | 7F7 | | | | | E | | | | | |
| " " | 5691 | | | C | | E | | | | | |
| (at 12.6 volts) | 12SC7 | | | | | E | | | | | |
| " " | 12SL7GT | | | | | E | | | | | |
| " " | 14F7 | | | | | E | | | | | |

**These substitutions apply particularly for television sets but may be used anywhere providing all changes, particularly B and C are considered.**

For details of changes indicated Refer to page 28

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | A NO CHANGES | B FIL. VOLTS | C FIL. CURRENT | D REWIRE SOCKET | E CHANGE SOCKET | F REALIGN | G ADD TOP CAP CONNECTION | H REMOVE TOP CAP CONNECTION | K CHANGE BIAS OR PLATE VOLTS | NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 12SN7GT | 12AH7GT | | | C | D | | F | | | K | |
| | 12AU7 | | | C | | E | F | | | | |
| | 12AV7 | | | | | E | F | | | K | |
| | 12SX7GT | | | | | | F | | | | |
| | 14N7 | | | | | E | F | | | | |
| | 5687 | | | C | | E | F | | | | |
| | 5694 | | B | C | D | | F | | | K | |
| | 6SN7GT | | B | C | | | F | | | | |
| | 5692 | | B | C | | | F | | | | |
| | 14AF7 | | | C | | E | F | | | | |
| | 6F8G | | B | C | | E | F | | | | |
| | 12BH7 | | | | | E | F | | | | |
| 19BG6G | 25BQ6GT | | B | | D | | F | | | | 14 |
| | 807 (W) | | B | C | | E | F | | | | |
| | 6CD6G | | B | C | | | F | | | | 10 |
| 19BG6G (Continued) | 6BQ6GT | | B | C | D | | F | | | | 10–14 |
| | 6BG6G | | B | C | | | F | | | | |
| 25BQ6GT | 19BG6G | | B | | D | | F | | | | |
| | 807 (W) | | B | C | | E | F | | | | |
| | 6CD6G | | B | C | D | | F | | | | |
| | 6BQ6GT | | B | C | | | F | | | | |
| | 6BG6G | | B | C | D | | F | | | | |
| 25W4GT | 25Z6 | | | | | E | | | | | 19 |
| | 25Z5 | | | | D | | | | | | 19 |
| | 35Z3 | | B | C | | E | | | | | 19, 21 |
| | 35Y4 | | B | C | | E | | | | | 19, 21 |
| | 50AX6G | | B | | D | | | | | | 19 |
| | 50X6 | | B | C | | E | | | | | 19 |
| | 6W4GT | | B | C | | | | | | | |
| | 6U4GT | | B | C | | | | | | | |

## NOTES FOR USE WITH TELEVISION TUBE TABLE

A. This is shown only when the tubes are directly interchangeable for all published ratings. Unusual operating conditions may require analysis.

B. This means that the heater voltage of the substitute type is different from the required type. A slight decrease can be taken care of by adding a series resistor but other changes may require a complete change in the power circuits or the addition of an extra transformer to provide the required voltage.

C. Indicates that the heater current of the substitute tube is different from the required type. On transformer operated sets this is not too important unless the total current, particularly when more than one substitution is made, causes the transformer rating to be exceeded.

D. In these cases the tube socket is the same but some rearrangement of the connections may be necessary. It may only be necessary to be sure that contacts connected to elements of the substitute tube which are not required in that circuit are not used as tie points.

E. Requires a different type of socket. Watch out for tie points as in "D".

F. Realignment is recommended as good practice in all cases of RF and IF tube changes.

G. Provision must be made for connection to the top cap of the substitute tube which was not originally required.

H. The former top-cap connection will have to be changed to connect to a base pin.

K. Indicates that the substitute tube operates at a different bias for the applied plate voltage than the original tubes. Self bias circuits give some automatic correction but this should be measured and changed if necessary to prevent early failures.

(1) The use of a sharp cut-off pentode in place of a remote cut-off tube may cause great distortion in locations when strong signals are available. If no other substitute can be found all tubes on the A.V.C. system should be changed.

(2) The optimum load resistance for these types is more than 20% off. If tone or volume is noticeably poor transformer tap adjustment or a new transformer may be required.

(3) Requires addition of screen voltage, resistor and bypass condenser. Select resistor to give screen volts approximately equal to actual plate volts.

(4) This type can be used as a triode by tying screen and suppressor to the plate. As a rectifier tie all grids to plate.

(5) If separate cathode connections to the diodes are required one or two type 1N34 crystals may be used.

(6) Screen voltage should be decreased to prevent oscillation with this higher gm tube or to keep within tube ratings.

(7) Screen voltage may be increased for this type.

(8) Circuit for this substitution is given on last few pages of this booklet.

(9) Unused elements should be connected to chassis or cathode terminal.

(10) Pilot lamp may be omitted or provided for by other means.

(11) Connect triode elements together to form two diodes having separate cathodes.

(12) Usable only when space is available for two tubes of this type connected in parallel.

(13) Usable only in fly-back type power supplies and when peak inverse voltage does not exceed tube rating.

(14) In many of the older sets a high efficiency transformer and/or yoke may also be required.

(15) The substitution of these types in RF or mixer oscillator stage is not recommended. Changes in lead length or capacity may make it impossible to align.

(16) Not usable in circuits requiring separate cathode leads.

(17) If circuit requires voltage between cathode and heater do not use this type.

(18) Connect grid and screen to plate to obtain diode characteristics.

(19) Not recommended for damper service as peak inverse rating is too low.

(20) These types do not have as high a heater-cathode peak voltage rating as the original tube but may be used in most cases. An isolation transformer insulated for 2500 volts may be used.

(21) Check load current to be sure it is within ratings of substitute tube.

(22) Connect triode sections in parallel.

(23) If arcing occurs peak voltage rating is being exceeded. A type having a higher peak rating will be required.

**These substitutions apply particularly for television sets but may be used anywhere providing all changes particularly B and C are considered.**

# SUBSTITUTION CHART FOR TELEVISION PICTURE TUBES

THE following tables show some of the possible substitutions which may be made when the required type is temporarily unobtainable. Individual listings of all tube types bearing an A or B suffix have not been included in this table. These letters generally indicate a difference only in face, plate or screen treatment not materially affecting the tube's application. A copy of Sylvania's Television Picture Tube Characteristics Chart lists these types bearing suffixes and indicates their face plate characteristics. The tables have been extended slightly to show a few larger type tubes that may be used when it is desired to increase the size of the picture.

Before undertaking any of the more radical changes, the ease of adjustment provided by the receiver under consideration should be examined. If the focus coil and yoke supporting assembly are not adjustable in the direction of the long axis of the tube, it may be too difficult to use any tube having a longer cone. The wide variety of cabinets will also require that each case be examined carefully to be sure that there is room in the cabinet for the tube. Some designs of deflection and focus coils are longer than others so that short neck tubes cannot be directly interchanged. This fact is indicated in the notes when a short-neck tube would usually be a good replacement.

The tables indicate the important physical and electrical changes required but it was necessary to make the following assumptions: (a) Since the usual tolerance in the overall length of a picture tube is $\pm\frac{3}{8}''$ the dimension shown under B is given only to the nearest $\frac{1}{4}''$. (b) Since the new wide-angle picture tubes require more scanning power than the older tubes, and since there is usually some adjustment in the receiver circuit, we have assumed that a major coil change will not be required unless the replacement tube's deflection angle is greater than the original tube's by more than 4 degrees. (c) Besides the major changes in bulb dimensions considered under columns A and B there are also small changes in the radius of curvature of the bulb face and the shape of the picture area. This affects the mask dimensions and might give trouble in some sets if the adjustments are not flexible. Small changes in curvature radius of the cone may also be encountered, particularly between glass and metal types.

In a few cases we have listed replacement types smaller than the originals, because there are few or no tubes of the same or larger sizes which would, in our opinion, make practical substitutes.

For details of changes indicated Refer to page 34

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | A BULB DIAMETER | B BULB LENGTH | C CONNECTOR | D ADD ION TRAP MAG. | E REMOVE ION TRAP MAG. | F CHANGE OPERATING VOLTS | G CHANGE DEFLECTION CIRCUIT | H CHANGE TUBE SOCKET | K ADD FILTER CAPACITANCE | NOTE NO |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3KP4 | 3GP1A | | | | | | | | H | | 2 |
| | 3JP1 | | −1½ | | | | | | H | | |
| 3NP4 | None | | | | | | | | | | |
| 5BP4 | 5NP4 | No changes | | | | | | | | | |
| | 7EP4 | A | −1¼ | | | | | | | | |
| 5HP4 | 5NP4 | No changes | | | | | | | | | |
| 5TP4 | None | | | | | | | | | | |
| 7DP4 | 10DP4 | A | +3½ | | | | | | | K | |
| 7EP4 | 5BP4-A | A | +1¼ | | | | | | | | |
| | 7JP4 | | −1 | | | | | | H | | |
| 7GP4 | 7JP4 | No changes | | | | | | | | | |
| | 10HP4 | A | +4¾ | | | | | | | | |
| | 8BP4 | A | +2 | | | | | | | | |
| 7JP4 | 7GP4 | | | | | | F | | | | |
| | 10HP4 | A | +4¾ | | | | | | | | |
| | 8BP4 | A | +2 | | | | | | | | |
| 8AP4 | 10MP4 | A | +2¾ | C | D2 | | | | | | 4, 1 |
| | 12VP4 | A | +3¾ | C | D2 | | | | | | 4, 1 |
| | 10BP4 | A | +3½ | C | D2 | | | | | | 8, 4 |
| | 10FP4 | A | +3½ | C | | E | | | | | 1, 8, 4 |
| | 12JP4 | A | +3 | C | | E | | | | | 8, 1 |
| | 12UP4 | A | +4½ | | D2 | | | | | | 8, 1 |
| 9AP4 | 12AP4 | A | +4⅜ | | | | | | | | |
| 10BP4 | 10CP4 | | −1 | C | | E | | | | | |
| | 10FP4 | | | | | E | | | | | |
| | 12JP4 | A | | C | | E | | | | K | |
| | 12KP4 | A | | | | E | | | | | |

For details of changes indicated Refer to page 34

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | A BULB DIAMETER | B BULB LENGTH | C CONNECTOR | D ADD ION TRAP MAG. | E REMOVE ION TRAP MAG. | F CHANGE OPERATING VOLTS | G CHANGE DEFLECTION CIRCUIT | H CHANGE TUBE SOCKET | K ADD FILTER CAPACITANCE | NOTE NO |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10BP4 (Continued) | 12LP4 | A | +1 | | | | | | | | |
| | 12UP4 | A | +1 | C | | | | | | K | 6 |
| | 14BP4□ | A | | | | | | G | | | |
| | 14CP4 □ | A | −1 | | D1 | | | G | | | |
| 10CP4 | 10BP4 | | +1 | C | D2 | | | | | | |
| | 10FP4 | | +1 | C | | | | | | | |
| | 12JP4 | A | +½ | | | | | | | | |
| | 12KP4 | A | +1 | C | | | | | | | |
| | 12LP4 | A | +1¾ | C | D2 | | | | | | |
| | 12UP4 | A | +2 | C | D2 | | | | | K | 6 |
| | 14BP4□ | A | | C | D2 | | | G | | | |
| | 14CP4 □ | A | | C | | E | | G | | | |
| 10DP4 | 7DP4 | A | −3½ | | | | F | | | | 4 |
| 10FP4 | 10BP4 | | | | D2 | | | | | | |
| | 10CP4 | | −1 | C | | | | | | | |
| | 12JP4 | A | | C | | | | | | K | |
| | 12KP4 | A | | | | | | | | | |
| | 12LP4 | A | +1 | | D2 | | | | | | |
| | 12UP4 | A | +1 | C | D2 | | | | | K | 6 |
| | 14BP4□ | A | −1 | | D2 | | | G | | | |
| | 14CP4 □ | A | −1 | | D1 | | | G | | | |
| 10HP4 | 7GP4 | A | −4¾ | | | | F | | | | |
| | 7JP4 | A | −4¾ | | | | F | | | | |
| | 10GP4 | | −¾ | | | | | | | | |
| | 8BP4 | A | −2¾ | | | | | | | | |
| 10MP4 | 8AP4 | A | −2¾ | C | D1 | | F | | | | 6 |
| | 12VP4 | A | +1 | | D1 | | | | | | 1, 6 |
| | Also 10″ types under 10BP4 but add note | | | | | | | | | | 8 |
| 12AP4 | 9AP4 | A | −4¼ | | | | | | | | |
| 12JP4 | 12KP4 | A | | C | | | | | | | 4 |

□ Indicates rectangular tubes

**SAFETY FIRST: Wear goggles and gloves when handling Picture Tubes. Be sure power supply is turned off before working on high-voltage circuits.**

For details of changes indicated Refer to page 34

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | A BULB DIAMETER | B BULB LENGTH | C CONNECTOR | D ADD ION TRAP MAG. | E REMOVE ION TRAP MAG. | F CHANGE VOLTS | G CHANGE OPERATING CIRCUIT | H CHANGE DEFLECTION | J CHANGE TUBE SOCKET | K ADD FILTER CAPACITANCE | NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12JP4 (Cont'd) | 12LP4 | A | +1¼ | C | D2 | | | | | | | 4 |
| | 12QP4 | A | | | D1 | | | | | | | |
| | 12RP4 | | | | D1 | | | | | | K | |
| | 12TP4 | A | +1¼ | C | D2 | | | | | | | |
| | 12UP4 | A | +1¼ | C | D2 | | | | | | | 6 |
| | 14BP4 □ | A | −¾ | C | D2 | | | G | | | | 4 |
| | 14CP4 □ | A | −¾ | C | D1 | | | G | | | | |
| 12KP4 | 12JP4 | A | | C | | | | | | | K | |
| | 12LP4 | | +¾ | | D2 | | | | | | | |
| | 12QP4 | | | C | D1 | | | | | | K | |
| | 12RP4 | A | | C | D1 | | | | | | K | |
| | 12TP4 | | +¾ | | D2 | | | | | | K | |
| | 12UP4 | A | +1 | C | D2 | | | | | | K | 6 |
| | 14BP4 □ | A | −1 | | D2 | | | G | | | | |
| | 14CP4 □ | A | −1 | | D1 | | | G | | | | |
| | 16LP4 | A | +4½ | | D2 | | | | | | | |
| | 16TP4 □ | A | +½ | | D1 | | | G | | | | 7 |
| 12LP4 | 12JP4 | A | −1¼ | C | | E | | | | | K | |
| | 12QP4 | | −1¼ | C | D1 | | | | | | K | |
| | 12RP4 | A | −1¼ | C | D1 | | | | | | K | |
| | 12TP4 | | | | | | | | | | K | |
| | 12UP4 | A | | C | | | | | | | K | 6 |
| | 14BP4 □ | A | −2 | | | | | G | | | | |
| | 14CP4 □ | A | −2 | | D1 | | | G | | | | |
| | 16LP4 | A | +3½ | | | | | | | | | |
| | 16TP4 □ | A | −½ | | D1 | | | G | | | | 7 |
| | 12KP4 | | −¾ | | | E | | | | | | |
| 12QP4 | 12JP4 | A | | | | E | | | | | | |
| | 12LP4 | | +1¼ | C | D2 | | | | | | | 4 |
| | 12RP4 | A | | | | | | | | | | |
| | 12TP4 | | +1¼ | C | D2 | | | | | | | |
| | 12UP4 | A | +1 | C | D2 | | | | | | | 6 |
| | 14BP4 □ | A | −¾ | C | D2 | | | G | | | | 4 |
| | 14CP4 □ | A | −¾ | C | | | | G | | | | 4 |
| | 16LP4 | A | +4¾ | C | D2 | | | | | | K | |
| | 16TP4 □ | A | +½ | C | | | | G | | | | 4, 7 |
| | 12KP4 | | | C | | E | | | | | | |
| 12TP4 | 12JP4 | A | −¾ | C | | E | | | | | | 4 |
| | 12LP4 | | | | | | | | | | K | |
| | 12QP4 | | −¾ | C | D1 | | | | | | | |
| | 12RP4 | A | −¾ | C | D1 | | | | | | | |
| | 12UP4 | A | | C | | | | | | | | 6 |
| | 14BP4 □ | A | −2 | | | | | G | | | | 4 |
| | 14CP4 □ | A | −2 | | D1 | | | G | | | | 4 |
| | 16LP4 | A | +3½ | | | | | | | | | 4 |
| | 16TP4 □ | A | −¾ | | D1 | | | G | | | | 7 |
| | 12KP4 | | −1 | | | E | | | | | | 4 |
| 12UP4 | 12JP4 | A | −1 | C | | E | | | | | | |
| | 12KP4 | | −1 | C | | E | | | | | | 4 |
| | 12LP4 | | | C | | | | | | | | 4 |
| | 12QP4 | | −1 | C | D1 | | | | | | | |
| | 12RP4 | A | −1 | C | D1 | | | | | | | |
| | 12TP4 | | | C | | | | | | | | |
| | 14BP4 □ | A | −2¼ | C | | | | G | | | | 4 |
| | 14CP4 □ | A | −2 | C | D1 | | | G | | | | 4 |
| | 16LP4 | A | +3¾ | C | | | | | | | | 4 |
| | 16TP4 □ | A | −½ | C | D1 | | | G | | | | 4, 7 |
| | 16GP4 | A | −1 | | D1 | | | G | | | | 7 |
| 12VP4 | 10MP4 | A | −1 | | | | F | | | | | |
| | 8AP4 | A | | C | D1 | | F | | | | K | 6 |
| | 12LP4 | | +¾ | | | | | | | | | 8 |
| | Other 12″ types under 12LP4 but add note | | | | | | | | | | | 8 |
| 14BP4 □ | 14CP4 □ | | | | D1 | | | | | | | |
| | 14DP4 □ | | | | | | | | | | K | |
| | 14EP4 □ | | −½ | | D1 | | | | | | | 7 |
| | 16KP4 □ | A | +2 | | D1 | | | | | | | |
| | 16TP4 □ | A | +1½ | | D1 | | | | | | | |
| | 16UP4 □ | A | +1½ | | D1 | | | | | | K | 7 |
| 14BP4 (Cont'd) | 17AP4 □ | A | +2 | | D1 | | | | | | | 7 |
| | 17BP4 □ | A | +2¾ | | D1 | | | | | | | |
| | If cabinet space permits, round types listed under type 16SP4 may also be used. Add 1″ to dimension change B. | | | | | | | | | | | |
| 14CP4 □ | 14BP4 □ | | | | D2 | | | | | | | |
| | 14DP4 □ | | | | D2 | | | | | | K | |
| | 14EP4 □ | | −½ | | | | | | | | | 7 |
| | 16KP4 □ | A | +2 | | | | | | | | | |
| | 16TP4 □ | A | +1½ | | | | | | | | | 7 |
| | 16UP4 □ | A | +1½ | | | | | | | | K | 7 |
| | 17AP4 □ | A | +2 | | | | | | | | | 7 |
| | 17BP4 □ | A | +2¾ | | | | | | | | | |
| | If cabinet space perimts, round types listed under 16YP4 may also be used. Add ¾″ to dimension change B. | | | | | | | | | | | |
| 14DP4 □ | 14BP4 □ | | | | | | | | | | | 4 |
| | 14CP4 □ | | | | D1 | | | | | | | 4 |
| | 14EP4 □ | | −½ | | D1 | | | | | | | 4, 7 |
| | 16KP4 □ | A | +2 | | D1 | | | | | | K | 4 |
| | 16TP4 □ | A | +1½ | | D1 | | | | | | K | 4, 7 |
| | 16UP4 □ | A | +1½ | | D1 | | | | | | | 4, 7 |
| | 17AP4 □ | A | +2 | | D1 | | | | | | K | 4, 7 |
| | 17BP4 □ | A | +2¾ | | D1 | | | | | | K | 4 |
| | If cabinet space permits, round types listed under type 16WP4 may also be used. Add 1″ to dimension change B. | | | | | | | | | | | |
| 14EP4 □ | 14BP4 □ | | +½ | | D2 | | | | | | | |
| | 14CP4 □ | | +½ | | | | | | | | | |
| | 14DP4 □ | | +½ | | D2 | | | | | | K | |
| | 16KP4 □ | A | +2½ | | | | | | | | | |
| | 16TP4 □ | A | +2 | | | | | | | | | |
| | 16UP4 □ | A | +2 | | | | | | | | K | |
| | 17AP4 □ | A | +2½ | | | | | | | | | 7 |
| | 17BP4 □ | A | +3¼ | | | | | | | | | |
| | If cabinet space permits, round types listed under type 16YP4 may also be used. Add 1″ to dimension change B. | | | | | | | | | | | |
| 15AP4 | 15CP4 | | +1 | C | D2 | | | | | | | |
| | 15DP4 | | | | D2 | | | | | | | |
| | 16AP4 | A | +1¾ | C | D2 | | | | | | | 6 |
| | 16CP4 | A | +1 | C | D2 | | | | | | | |
| | 16DP4 | A | +¼ | C | D2 | | | | | | | |
| | 16EP4 | A | −1 | C | D2 | | | | | | | 6 |
| | 16FP4 | A | −¼ | | D1 | | | | | | | |
| | 16GP4 | A | −3 | C | D1 | | | G | | | | 6, 7 |
| | 16HP4 | A | +¾ | C | D2 | | | | | | | 4 |
| | 16JP4 | A | +¼ | C | D2 | | | G | | | | 4 |
| | 16KP4 □ | A | −1¾ | C | D1 | | | G | | | | 4 |
| | 16LP4 | A | +1¾ | C | D2 | | | | | | | 4 |
| | 16QP4 □ | A | −1½ | C | D2 | | | G | | | | |
| | 16RP4 □ | A | −1¾ | C | D1 | | | G | | | | 4 |
| | 16SP4 | A | −3¼ | C | D2 | | | G | | | | 4, 7 |
| | 16TP4 □ | A | −2¼ | C | D1 | | | G | | | | 4, 7 |
| | 16UP4 □ | A | −2¼ | C | D1 | | | G | | | | 7 |
| | 16VP4 | A | −3¼ | C | D1 | | | G | | | | 7 |
| | 16WP4 | A | −2¾ | C | D2 | | | G | | | | |
| | 16WP4A | A | −2¾ | C | D2 | | | G | | | | 4 |
| | 16XP4 □ | A | −1¾ | C | D2 | | | G | | | | |
| | 16YP4 | A | −3¼ | C | D1 | | | G | | | | 4, 7 |
| | 16ZP4 | A | +1¾ | C | D2 | | | | | | | 4 |
| | 17AP4 □ | A | −2 | C | D1 | | | G | | | | 4, 7 |
| | 17BP4 □ | A | −1¼ | C | D1 | | | G | | | | 4 |
| | 20BP4 | A | +8¼ | C | | | | | | | | |
| 15CP4 | 15AP4 | | −1 | C | | E | | | | | | |
| | 15DP4 | | −1 | C | | | | G | | | | |
| | 16AP4 | A | +¾ | C | | | | | | | | 6 |
| | 16CP4 | A | | | | | | | | | | |
| | 16DP4 | A | −¾ | | | | | G | | | | |
| | 16EP4 | A | −2 | C | | | | G | | | | 6 |

□ Indicates rectangular tubes

SAFETY FIRST: Wear goggles and gloves when handling Picture Tubes. Be sure power supply is turned off before working on high-voltage circuits.

For details of changes indicated Refer to page 34

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | A BULB DIAMETER | B BULB LENGTH | C CONNECTOR | D ADD ION TRAP MAG. | D REMOVE ION TRAP MAG. | E CHANGE VOLTS OPERATING | E CHANGE DEFLECTION CIRCUIT | F CHANGE TUBE SOCKET | G ADD FILTER CAPACITANCE | H NOTE NO. | K | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15CP4 (Cont'd) | 16FP4 | A | −1¼ | C | D1 | | | | | G | | | |
| | 16HP4 | A | −¼ | | | | | | | G | | | 4 |
| | 16JP4 | A | −¾ | | | | | | | G | | | 4 |
| | 16LP4 | A | +¾ | | | | | | | | | | 4 |
| | 16ZP4 | A | +¾ | | | | | | | | | | 4 |
| | 20BP4 | A | +7¼ | C | | | E | | | | | | |
| 15DP4 | 15AP4 | | | | | | E | | | | | | |
| | 15CP4 | | +1 | C | | | | | | | | | |
| | 16AP4 | A | +1¾ | C | | | | | | | | | 6 |
| | 16CP4 | A | +1 | C | | | | | | | | | |
| | 16DP4 | A | +¼ | C | | | | | | | | | |
| | 16EP4 | A | −1 | C | | | | | | | | | 6 |
| | 16FP4 | A | −¼ | | D1 | | | | | | | | |
| | 16HP4 | A | +¾ | C | | | | | | | | | 4 |
| | 16JP4 | A | +¼ | C | | | | | | | | | 4 |
| | 16LP4 | A | +1¾ | C | | | | | | | | | 4 |
| | 16ZP4 | A | +1¾ | C | | | | | | | | | 4 |
| | 20BP4 | A | +8¼ | C | | | E | | | | | | |
| | 17AP4 □ | A | −2 | C | D1 | | | | | G | | | 4, 7 |
| | 17BP4 □ | A | −1¼ | C | D1 | | | | | G | | | 4 |
| 16AP4 | 16CP4 | | −¾ | C | | | | | | | | | |
| | 16LP4 | | | C | | | | | | | | | 4 |
| | 16ZP4 | | | C | | | | | | | | | 4 |
| | 20BP4 | A | +6½ | C | | | E | | | | | | |
| | 16GP4 | | +3¼ | | D1 | | | | | G | | | 7 |
| | 16TP4 □ | A | −4¼ | C | D1 | | | | | G | | | 4, 7 |
| | 17AP4 □ | A | −4¼ | C | D1 | | | | | G | | | 4, 7 |
| | 17BP4 □ | A | −3 | C | D1 | | | | | G | | | 4 |
| | 19AP4 | A | −¾ | | D1 | | | | | G | | | |
| | 19DP4 | A | −¾ | C | | | | | | G | | | 4 |
| | 19EP4 | A | −1 | C | D1 | | | | | G | | | 4 |
| 16CP4 | 15AP4 | A | −1 | C | | | E | | | | | | |
| | 16AP4 | | +¾ | C | | | | | | | | | |
| | 16LP4 | | +¾ | | | | | | | | | | 4 |
| | 16ZP4 | | +¾ | | | | | | | | | | 4 |
| | 16GP4 | | −4¼ | C | D1 | | | | | G | | | 6, 7 |
| | 16TP4 □ | A | −3½ | | D1 | | | | | G | | | 4, 7 |
| | 17AP4 □ | A | −3 | | D1 | | | | | G | | | 4, 7 |
| | 17BP4 □ | A | −2¼ | | D1 | | | | | G | | | 4 |
| | 19AP4 | A | | C | D1 | | | | | G | | | 6 |
| | 19DP4 | A | | | | | | | | G | | | 4 |
| | 19EP4 | A | −¼ | | D1 | | | | | G | | | 4 |
| | 20BP4 | A | +7¼ | C | | | E | | | G | | | |
| 16DP4 | 16AP4 | | +1½ | C | | | | | | | | | 6 |
| | 16CP4 | | +¾ | | | | | | | | | | |
| | 16EP4 | | −1 | C | | | | | | | | | 6 |
| | 16FP4 | | −½ | C | D1 | | | | | | | | |
| | 16HP4 | | +½ | | | | | | | | | | 4 |
| | 16JP4 | | | | | | | | | | | | 4 |
| | 16KP4 □ | A | −2 | | D1 | | | | | | | | 4 |
| | 16LP4 | | +1½ | | | | | | | | | | 4 |
| | 16QP4 □ | A | −1½ | | | | | | | | | | |
| | 16RP4 □ | A | −2 | | D1 | | | | | | | | 4, 7 |
| | 16TP4 □ | A | −2½ | | D1 | | | | | | | | 4 |
| | 16UP4 □ | A | −2½ | | D1 | | | | | | | | 7 |
| | 16XP4 □ | A | −2 | | | | | | | | | | |
| | 16ZP4 | | +1½ | | | | | | | | | | 4 |
| | 17AP4 □ | A | −2 | | D1 | | | | | | | | 4, 7 |
| | 17BP4 □ | A | −1½ | | D1 | | | | | | | | 4 |
| | 19EP4 | A | +¼ | | D1 | | | | | | | | 4 |
| | 20BP4 | A | +8 | C | | | E | | | | | | |
| 16EP4 | 16AP4 | | +2¾ | | | | | | | | | | |
| | 16CP4 | | +2 | C | | | | | | | | | |
| | 16DP4 | | +1¼ | C | | | | | | | | | |
| | 16FP4 | | +¾ | C | D1 | | | | | | | | |
| | 16HP4 | | +1¾ | C | | | | | | | | | 4 |
| | 16JP4 | | +1 | C | | | | | | | | | 4 |
| | 16KP4 □ | A | −1 | C | D1 | | | | | | | | 4 |
| | 16LP4 | | +2¾ | C | | | | | | | | | 4 |

For details of changes indicated Refer to page 34

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | A BULB DIAMETER | B BULB LENGTH | C CONNECTOR | D ADD ION TRAP MAG. | D REMOVE ION TRAP MAG. | E CHANGE VOLTS OPERATING | E CHANGE DEFLECTION CIRCUIT | F CHANGE TUBE SOCKET | G ADD FILTER CAPACITANCE | H NOTE NO. | K | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16EP4 (Cont'd) | 16QP4 □ | A | −½ | C | | | | | | | | | |
| | 16RP4 □ | A | −1 | C | D1 | | | | | | | | 4 |
| | 16TP4 □ | A | −1½ | C | D1 | | | | | | | | 4, 7 |
| | 16UP4 □ | A | −1½ | C | D1 | | | | | | | | 7 |
| | 16XP4 □ | A | −1 | C | | | | | | | | | |
| | 16ZP4 | | +2¾ | C | | | | | | | | | 4 |
| | 17AP4 □ | A | −1 | C | D1 | | | | | | | | 4, 7 |
| | 17BP4 □ | A | −¼ | C | D1 | | | | | | | | 4 |
| | 19EP4 | A | +1½ | C | D1 | | | | | | | | 4 |
| | 20BP4 | A | +9 | C | | | E | | | | | | |
| 16FP4 | 16AP4 | | +2 | C | D2 | | | | | | | | 6 |
| | 16CP4 | | +1¼ | C | D2 | | | | | | | | |
| | 16DP4 | | +½ | C | D2 | | | | | | | | |
| | 16EP4 | | −¾ | C | D2 | | | | | | | | 6 |
| | 16HP4 | | +1¾ | C | D2 | | | | | | | | 4 |
| | 16JP4 | | +1 | C | D2 | | | | | | | | 4 |
| | 16KP4 □ | A | −1 | C | | | | | | | | | 4 |
| | 16LP4 | | +2½ | C | D2 | | | | | | | | 4 |
| | 16QP4 □ | A | −½ | C | D2 | | | | | | | | |
| | 16RP4 □ | A | −1 | C | | | | | | | | | 4 |
| | 16TP4 □ | A | −1½ | C | | | | | | | | | 4, 7 |
| | 16UP4 □ | A | −1½ | C | | | | | | | | | 7 |
| | 16XP4 □ | A | −1 | C | D2 | | | | | | | | |
| | 16ZP4 | | +2½ | C | D2 | | | | | | | | 4 |
| | 17AP4 □ | A | −1 | C | | | | | | | | | 4, 7 |
| | 17BP4 □ | A | −¼ | C | | | | | | | | | 4 |
| | 19EP4 | A | +1½ | C | | | | | | | | | 4 |
| | 20BP4 | A | +8 | C | | | E | | | | | | |
| | 19GP4 | A | +1 | C | | | | | | | | | |
| 16GP4 | 16EP4 | | +2 | | D2 | | | | | | | | |
| | 16SP4 | | −¼ | C | D2 | | | | | | | | 4 |
| | 16KP4 □ | A | +1¼ | C | | | | | | | | | 4 |
| | 16QP4 □ | A | +1½ | C | D2 | | | | | | | | |
| | 16RP4 □ | A | +¾ | C | | | | | | | | | 4 |
| | 16TP4 □ | A | +½ | C | | | | | | | | | 4 |
| | 16UP4 □ | A | +½ | C | | | | | | | | | |
| | 16VP4 | | −¼ | C | | | | | | | | | |
| | 16WP4 | | −¼ | C | D2 | | | | | | | | |
| | 16WP4A | | −¼ | C | D2 | | | | | | | | 4 |
| | 16XP4 □ | A | +1¼ | C | D2 | | | | | | | | |
| | 16YP4 | | −¼ | C | | | | | | | | | 4 |
| | 17AP4 □ | A | +1 | C | | | | | | | | | 4 |
| | 19AP4 | A | +4 | | | | | | | | | | |
| | 19DP4 | A | +4 | C | D2 | | | | | | | | 4 |
| | 19EP4 | A | +3½ | C | | | | | | | | | 4 |
| | 19FP4 | A | +4½ | C | D2 | | | | | | | | |
| | 19GP4 | A | +3¾ | C | | | | | | | | | |
| | 22AP4 | A | +5½ | | | | | | | | | | |
| 16HP4 | 16AP4 | | +1 | C | | | | | | | | K | 6 |
| | 16CP4 | | +¼ | | | | | | | | | K | |
| | 16DP4 | | −½ | | | | | | | | | K | |
| | 16EP4 | | −1½ | C | | | | | | | | K | 6 |
| | 16FP4 | | −1 | C | D1 | | | | | | | K | |
| | 16JP4 | | −½ | | | | | | | | | | |
| | 16KP4 □ | A | −1½ | | D1 | | | | | | | | |
| | 16LP4 | | +1 | | | | | | | | | | |
| | 16QP4 □ | A | −2 | | | | | | | | | K | |
| | 16RP4 □ | A | −2½ | | D1 | | | | | | | | |
| | 16TP4 □ | A | −3 | | D1 | | | | | | | | 7 |
| | 16UP4 □ | A | −3 | | D1 | | | | | | | K | 7 |
| | 16XP4 □ | A | −2½ | | | | | | | | | K | |
| | 16ZP4 | | +1 | | | | | | | | | | |
| | 17AP4 □ | A | −2½ | | D1 | | | | | | | | 7 |
| | 17BP4 □ | A | −2 | | D1 | | | | | | | | |
| | 19EP4 | A | | | D1 | | | | | | | | |
| | 20BP4 | A | +11 | C | | | E | | | | | K | |
| 16JP4 | 16AP4 | | +1½ | C | | | | | | | | | 6 |
| | 16CP4 | | +¾ | | | | | | | | | | |
| | 16DP4 | A | | | | | | | | | | K | |
| | 16EP4 | | +1 | C | | | | | | | | | 6 |

□ Indicates rectangular tubes.

**SAFETY FIRST: Wear goggles and gloves when handling Picture Tubes. Be sure power supply is turned off before working on high-voltage circuits.**

For details of changes indicated Refer to page 34

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | BULB DIAMETER | BULB LENGTH | CONNECTOR | ADD ION TRAP MAG. | REMOVE ION TRAP MAG. | CHANGE OPERATING VOLTS | CHANGE DEFLECTION CIRCUITRY | CHANGE TUBE SOCKET | ADD FILTER CAPACITANCE | NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | H | K | |
| 16JP4 (Cont'd) | 16FP4 | | −½ | C | D1 | | | | | | |
| | 16HP4 | | +½ | | | | | | | | |
| | 16KP4 □ | A | −2 | | D1 | | | | | | |
| | 16LP4 | | +1½ | | | | | | | | |
| | 16MP4 | | +1 | | | | | | | | |
| | 16QP4 □ | A | −1½ | | | | | | | | |
| | 16RP4 □ | A | −2 | | D1 | | | | | | |
| | 16TP4 □ | A | +2½ | | D1 | | | | | | 7 |
| | 16UP4 □ | A | +2½ | | D1 | | | | | | 7 |
| | 16XP4 □ | A | −2 | | | | | | | | |
| | 16ZP4 | | +1½ | | | | | | | | |
| | 17AP4 □ | A | −2 | | D1 | | | | | | 7 |
| | 17BP4 □ | A | −1½ | | D1 | | | | | | |
| | 19EP4 | A | +¼ | | D1 | | | | | | |
| | 20BP4 | A | +8 | C | | E | | | | | |
| 16KP4 □ | 16RP4 □ | | | | | | | | | | |
| | 16QP4 □ | | +½ | | D2 | | | | | K | |
| | 16TP4 □ | | −½ | | | | | | | | 7 |
| | 16UP4 □ | | −½ | | | | | | | K | 7 |
| | 16XP4 □ | | | | D2 | | | | | K | |
| | 17AP4 □ | A | | | | | | | | | 7 |
| | 17BP4 □ | A | +½ | | | | | | | | |
| | If cabinet space permits, round types listed under 16YP4 may also be used. | | | | | | | | | | |
| 16LP4 | 15AP4 | A | −¼ | C | | E | | | | K | |
| | 15CP4 | A | −¾ | | | | | | | K | |
| | 16AP4 | | | C | | | | | | K | 6 |
| | 16CP4 | | −¾ | | | | | | | K | |
| | 16ZP4 | | | | | | | | | | |
| | 16GP4 | | −4¾ | | D1 | | | G | | K | 6, 7 |
| | 16TP4 □ | A | −4 | | D1 | | | G | | K | 7 |
| | 17AP4 □ | A | −3¾ | | D1 | | | G | | | 7 |
| | 17BP4 □ | A | −3 | | D1 | | | G | | | |
| | 19AP4 | A | −¾ | C | D1 | | | G | | K | 6 |
| | 19DP4 | A | −¾ | | | | | G | | | |
| | 19EP4 | A | −1 | | D1 | | | G | | | |
| | 20BP4 | A | +6½ | C | | E | | | | K | |
| 16MP4 | 16AP4 | | +½ | C | | | | | | K | 6 |
| | 16CP4 | | −¼ | | | | | | | K | |
| | 16DP4 | | −1 | | | | | | | K | |
| | 16EP4 | | −2 | C | | | | | | K | 6 |
| | 16FP4 | | −1½ | C | D1 | | | | | K | |
| | 16HP4 | | −½ | | | | | | | | |
| | 16JP4 | | −1 | | | | | | | | |
| | 16KP4 □ | A | −3 | | D1 | | | G | | | |
| | 16LP4 | | +½ | | | | | | | | |
| | 16QP4 □ | A | −2½ | | | | | G | | K | |
| | 16RP4 □ | A | −3 | | D1 | | | G | | | |
| | 16TP4 □ | A | −3½ | | D1 | | | G | | | 7 |
| | 16UP4 □ | A | −3½ | | D1 | | | G | | K | 7 |
| | 16XP4 □ | A | −3 | | | | | G | | K | |
| | 16ZP4 | | +½ | | | | | | | | |
| | 17AP4 □ | A | −3 | | D1 | | | | | | 7 |
| | 17BP4 □ | A | −2½ | | D1 | | | | | | |
| | 19EP4 | A | −¾ | | D1 | | | | | | |
| | 20BP4 | A | +7 | C | | E | | | | K | |
| 16QP4 □ | 16KP4 □ | | −½ | | D1 | | | | | | 4 |
| | 16RP4 □ | | −½ | | D1 | | | | | | 4 |
| | 16TP4 □ | | −1 | | D1 | | | | | | 4, 7 |
| | 16UP4 □ | | −1 | | D1 | | | | | | 7 |
| | 16XP4 □ | | −½ | | | | | | | | |
| | 17AP4 □ | A | −½ | | D1 | | | | | | 4, 7 |
| | 17BP4 □ | A | | | D1 | | | | | | 4 |
| | If cabinet space permits, round types listed under 16WP4 may also be used. | | | | | | | | | | |
| 16RP4 □ | 16KP4 □ | | | | | | | | | | |
| | 16QP4 □ | | +½ | | D2 | | | | | K | |
| | 16TP4 □ | | −¾ | | | | | | | | 7 |
| | 16UP4 □ | | −¾ | | | | | | | K | 7 |

For details of changes indicated Refer to page 34

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | BULB DIAMETER | BULB LENGTH | CONNECTOR | ADD ION TRAP MAG. | REMOVE ION TRAP MAG. | CHANGE OPERATING VOLTS | CHANGE DEFLECTION CIRCUITRY | CHANGE TUBE SOCKET | ADD FILTER CAPACITANCE | NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | H | K | |
| 16RP4 (Cont'd) | 16XP4 □ | | | | D2 | | | | | K | |
| | 17AP4 □ | A | | | | | | | | | 7 |
| | 17BP4 □ | A | +½ | | | | | | | | |
| | If cabinet space permits, round types listed under 16YP4 may also be used. | | | | | | | | | | |
| 16SP4 | 16AP4 | | +5 | C | | | | | | K | 6 |
| | 16CP4 | | +4¼ | | | | | | | K | |
| | 16DP4 | | +3½ | | | | | | | K | |
| | 16EP4 | | +2¼ | C | | | | | | K | 6 |
| | 16FP4 | | +3 | C | D1 | | | | | K | |
| | 16GP4 | | +¼ | C | D1 | | | | | K | 6 |
| | 16HP4 | | +4 | | | | | | | | |
| | 16JP4 | | +3½ | | | | | | | | |
| | 16KP4 □ | A | +1½ | | D1 | | | | | | |
| | 16LP4 | | +5 | | | | | | | | |
| | 16MP4 | | +4½ | | | | | | | | |
| | 16QP4 □ | A | +1¾ | | | | | | | K | |
| | 16RP4 □ | A | +1½ | | D1 | | | | | | |
| | 16TP4 □ | A | +¾ | | D1 | | | | | | |
| | 16UP4 □ | A | +¾ | | D1 | | | | | K | |
| | 16VP4 | | | | D1 | | | | | K | |
| | 16WP4 | | +½ | | | | | | | K | |
| | 16WP4A | | +½ | | | | | | | | |
| | 16XP4 □ | A | +1½ | | | | | | | K | |
| | 16YP4 | | | | D1 | | | | | | |
| | 16ZP4 | | +5 | | | | | | | | |
| | 17AP4 □ | A | +1¼ | | D1 | | | | | | |
| | 17BP4 □ | A | +2 | | D1 | | | | | | |
| | 19AP4 | A | +4¼ | C | D1 | | | | | K | 6 |
| | 19DP4 | A | +4¼ | | | | | | | | |
| | 19EP4 | A | +3¾ | | D1 | | | | | | |
| | 19FP4 | A | +4¾ | | | | | | | K | |
| | 19GP4 | A | +4 | | D1 | | | | | K | |
| | 20BP4 | A | +11½ | C | | E | | | | K | |
| | 22AP4 | A | +5½ | C | D1 | | | | | K | 6 |
| 16TP4 □ | 16KP4 □ | | +¾ | | | | | | | | |
| | 16QP4 □ | | +1 | | D2 | | | | | K | |
| | 16RP4 □ | | +¾ | | | | | | | | |
| | 16UP4 □ | | | | | | | | | K | |
| | 16XP4 □ | | +¾ | | D2 | | | | | K | |
| | 17AP4 □ | A | +½ | | | | | | | | |
| | 17BP4 □ | A | +1¼ | | | | | | | | |
| | If cabinet space permits, round types listed under 16YP4 may also be used. | | | | | | | | | | |
| 16UP4 □ | Same as listed above for type 16TP4 with deletion of note K when present and addition of note 4 for types not having note K. | | | | | | | | | | |
| 16VP4 | 16AP4 | | +5 | C | D2 | | | | | | 6 |
| | 16CP4 | | +4¼ | | D2 | | | | | | |
| | 16DP4 | | +3½ | | D2 | | | | | | |
| | 16EP4 | | +2¼ | C | D2 | | | | | | 6 |
| | 16FP4 | | +3 | C | | | | | | | |
| | 16GP4 | | +¼ | C | | | | | | | 6 |
| | 16HP4 | | +4 | | D2 | | | | | | 4 |
| | 16JP4 | | +3½ | | D2 | | | | | | 4 |
| | 16KP4 □ | A | +1½ | | | | | | | | 4 |
| | 16LP4 | | +5 | | D2 | | | | | | 4 |
| | 16MP4 | | +4½ | | D2 | | | | | | 4 |
| | 16QP4 □ | A | +1¾ | | D2 | | | | | | |
| | 16RP4 □ | A | +1½ | | | | | | | | 4 |
| | 16SP4 □ | | | | D2 | | | | | | 4 |
| | 16TP4 □ | A | +¾ | | | | | | | | 4 |
| | 16UP4 □ | A | +¾ | | | | | | | | |
| | 16WP4 | | +½ | | D2 | | | | | | |
| | 16WP4A | | +½ | | D2 | | | | | | 4 |
| | 16XP4 □ | A | +1½ | | D2 | | | | | | |
| | 16YP4 | | | | | | | | | | 4 |
| | 16ZP4 | | +5 | | D2 | | | | | | 4 |
| | 17AP4 □ | A | +1¼ | | | | | | | | 4 |

□ Indicates rectangular tubes.

**SAFETY FIRST: Wear goggles and gloves when handling Picture Tubes. Be sure power supply is turned off before working on high-voltage circuits.**

For details of changes indicated Refer to page 34

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | BULB DIAMETER | BULB LENGTH | CONNECTOR | ADD ION TRAP MAG. | REMOVE ION TRAP MAG. | CHANGE VOLTS OPERATING | CHANGE DEFLECTION CIRCUIT | CHANGE TUBE SOCKET | ADD FILTER CAPACITANCE | NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | H | K | |
| 16VP4 (Cont'd) | 17BP4 □ | A | +2 | | | | | | | | 4 |
| | 19AP4 | A | +4¼ | C | | | | | | | 6 |
| | 19DP4 | A | +4¼ | | D2 | | | | | | 4 |
| | 19EP4 | A | +3¾ | | | | | | | | 4 |
| | 19FP4 | A | +4¾ | | D2 | | | | | | |
| | 19GP4 | A | +4 | | | | | | | | |
| | 20BP4 | A | +11½ | C | | E | | | | | |
| | 22AP4 | A | +5½ | C | | | | | | | 6 |
| 16WP4 | 16AP4 | | +4½ | C | | | | | | | 6 |
| | 16CP4 | | +4 | | | | | | | | |
| | 16DP4 | | +3 | | | | | | | | |
| | 16EP4 | | +1¾ | C | | | | | | | 6 |
| | 16FP4 | | +2½ | C | D1 | | | | | | |
| | 16GP4 | | −¼ | C | D1 | | | | | | 7 |
| | 16HP4 | | +3½ | | | | | | | | 4 |
| | 16JP4 | | +3 | | | | | | | | 4 |
| | 16LP4 | | +4½ | | | | | | | | 4 |
| | 16MP4 | | +4 | | | | | | | | 4 |
| | 16QP4 □ | A | +1¼ | | | | | | | | |
| | 16KP4 □ | A | +1 | | D1 | | | | | | 4 |
| | 16RP4 □ | A | +1 | | D1 | | | | | | 4 |
| | 16SP4 | | −½ | | | | | | | | 4, 7 |
| | 16TP4 □ | A | +¼ | | D1 | | | | | | 4, 7 |
| | 16UP4 □ | A | +¼ | | D1 | | | | | | 7 |
| | 16VP4 | | −½ | | D1 | | | | | | 7 |
| | 16WP4A | | | | | | | | | | 4 |
| | 16XP4 □ | A | +1 | | | | | | | | |
| | 16YP4 | | −½ | | D1 | | | | | | 4, 7 |
| | 16ZP4 | | +5½ | | | | | | | | 4 |
| | 17AP4 □ | A | +¾ | | D1 | | | | | | 4, 7 |
| | 17BP4 □ | A | +1½ | | D1 | | | | | | 4 |
| | 19AP4 | A | +3¾ | C | D1 | | | | | | 6 |
| | 19DP4 | A | +3¾ | | | | | | | | 4 |
| | 19EP4 | A | +3¼ | | D1 | | | | | | 4 |
| | 19FP4 | A | +4¼ | | | | | | | | |
| | 19GP4 | A | +3½ | | D1 | | | | | | |
| | 20BP4 | A | +11 | C | | E | | | | | |
| | 22AP4 | A | +5 | C | D1 | | | | | | 6 |
| 16WP4A | Same as listed above for type 16WP4 with addition of note K for types not having note 4. | | | | | | | | | | |
| 16XP4 □ | 16KP4 □ | | | | D1 | | | | | | 4 |
| | 16QP4 □ | | +½ | | | | | | | | |
| | 16RP4 □ | | | | D1 | | | | | | 4 |
| | 16TP4 □ | | −½ | | D1 | | | | | | 4, 7 |
| | 16UP4 □ | | −½ | | D1 | | | | | | 7 |
| | 17AP4 □ | A | | | D1 | | | | | | 4, 7 |
| | 17BP4 □ | A | +½ | | D1 | | | | | | 4 |
| | If cabinet space permits, round types listed under 16WP4 may also be used. | | | | | | | | | | |
| 16YP4 | Same types as listed for 16VP4 with addition of note K for types not having note 4. | | | | | | | | | | |
| 16ZP4 | 16LP4 | | | | | | | | | | |
| | Also any type listed under 16LP4 with same changes. | | | | | | | | | | |
| 17AP4 □ | 16QP4 □ | A | +½ | | D2 | | | | | K | |
| | 16KP4 □ | A | | | | | | | | | |
| | 16RP4 □ | A | | | | | | | | | |
| | 16TP4 □ | A | −½ | | | | | | | | |
| | 16UP4 □ | A | −½ | | | | | | | K | |
| | 16XP4 □ | A | | | D2 | | | | | K | |
| | 17BP4 □ | | +¾ | | | | | | | | |
| | If cabinet space permits, round types listed under 16KP4 may also be used. | | | | | | | | | | |
| 17BP4 □ | 17AP4 □ | | −¾ | | | | | | | | 7 |
| | 16QP4 □ | A | | | D2 | | | | | K | |
| | 16KP4 □ | A | −½ | | | | | | | | |
| | 16RP4 □ | A | −½ | | | | | | | | |
| | 16TP4 □ | A | −1 | | | | | | | | 7 |
| | 16UP4 □ | A | −1 | | | | | | | K | 7 |
| | 16XP4 □ | A | −½ | | D2 | | | | | K | |

For details of changes indicated Refer to page 34

| REQUIRED TYPE | POSSIBLE REPLACEMENTS | BULB DIAMETER | BULB LENGTH | CONNECTOR | ADD ION TRAP MAG. | REMOVE ION TRAP MAG. | CHANGE VOLTS OPERATING | CHANGE DEFLECTION CIRCUIT | CHANGE TUBE SOCKET | ADD FILTER CAPACITANCE | NOTE NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | H | K | |
| 17BP4 (Cont'd) | If cabinet space permits, round types listed under 16YP4 may also be used. | | | | | | | | | | |
| 19AP4 | 17AP4 □ | A | −3 | C | | | | | | | 4, 6, 7 |
| | 17BP4 □ | A | −2¼ | C | | | | | | | 4, 6 |
| | 19DP4 | | | C | D2 | | | | | | 4, 6 |
| | 19EP4 | A | −½ | C | | | | | | | 4, 6 |
| | 19FP4 | | +½ | C | D2 | | | | | | 6 |
| | 19GP4 | | −¼ | C | | | | | | | 6 |
| | 20BP4 | A | +7¼ | C | | E | | | | | 6 |
| | 22AP4 | A | +1½ | | | | | | | | |
| | Also other types listed under 16GP4 with addition of change A and 4″ decrease in length differential. | | | | | | | | | | |
| 19DP4 | 17AP4 □ | A | −3 | | D1 | | | | | | 7 |
| | 17BP4 □ | A | −2¼ | | D1 | | | | | | |
| | 19AP4 | | | C | D1 | | | | | K | 6 |
| | 19EP4 | A | −½ | | D1 | | | | | | |
| | 19FP4 | | +½ | | | | | | | K | |
| | 19GP4 | | −¼ | | D1 | | | | | K | |
| | 20BP4 | A | +7¼ | C | | E | | | | K | |
| | 22AP4 | A | +1½ | C | D1 | | | | | K | 6 |
| | Also any 16″ types listed under 16SP4 with addition of change A and 4¼″ decrease in length differential | | | | | | | | | | |
| 19EP4 | 17AP4 □ | A | −2½ | | | | | | | | 7 |
| | 17BP4 □ | A | −2 | | | | | | | | |
| | 20BP4 | A | +7½ | C | | E | | | | K | |
| | 22AP4 | A | +1¾ | C | | | | | | K | 6 |
| | Also 16″ types listed under 16YP4 with 3¾″ decrease in length differential. | | | | | | | | | | |
| 19FP4 | 17AP4 □ | A | −3½ | | D1 | | | | | | 7, 4 |
| | 17BP4 □ | A | −2¾ | | D1 | | | | | | 4 |
| | 19AP4 | | −½ | C | D1 | | | | | | 6 |
| | 19DP4 | | −½ | | | | | | | | 4 |
| | 19EP4 | A | −1 | | D1 | | | | | | 4 |
| | 19GP4 | A | −¾ | | D1 | | | | | | |
| | 20BP4 | A | +6¾ | C | | E | | | | | |
| | 22AP4 | A | +1 | C | D1 | | | | | | 6 |
| | Also 16″ types listed under 16WP4 with 4¼″ decrease in length differential. | | | | | | | | | | |
| 19GP4 | 17AP4 □ | A | −2¾ | | | | | | | | 7, 4 |
| | 17BP4 □ | A | −2 | | | | | | | | 4 |
| | 19AP4 | | +¼ | C | | | | | | | 6 |
| | 19DP4 | | +¼ | | D2 | | | | | | 4 |
| | 19EP4 | A | −¼ | | | | | | | | 4 |
| | 19FP4 | | +¾ | | D2 | | | | | | |
| | 20BP4 | A | +7½ | C | | E | | | | | |
| | 22AP4 | A | +1½ | C | | | | | | | 6 |
| | Also 16″ types listed under 16VP4 with 4″ decrease in length differential. | | | | | | | | | | |
| 20BP4 | 16AP4 | A | −6½ | C | D2 | | | | | | |
| | 16CP4 | A | −7¼ | C | D2 | | | | | | |
| | 16LP4 | A | −6½ | C | D2 | | | | | | 4 |
| | 16ZP4 | A | −6½ | C | D2 | | | | | | 4 |
| | 16KP4 □ | A | −10 | C | D1 | | | G | | | 4 |
| | 16QP4 □ | A | −9½ | C | D2 | | | G | | | |
| | 16RP4 □ | A | −10 | C | D1 | | | G | | | 4 |
| | 16TP4 □ | A | −10½ | C | D1 | | | G | | | 4, 7 |
| | 16UP4 □ | A | −10½ | C | D1 | | | G | | | 7 |
| | 16XP4 □ | A | −10 | C | D2 | | | G | | | |
| | 17AP4 □ | A | −10 | C | D1 | | | G | | | 4, 7 |
| | 17BP4 □ | A | −9½ | C | D1 | | | G | | | 4 |
| | 22AP4 | A | −6 | C | D1 | | | G | | | 6 |
| 22AP4 | 19AP4 | A | −1½ | | | | | | | | |
| | 19DP4 | A | −1½ | C | D2 | | | | | | 4 |
| | 19EP4 | A | −1¾ | C | | | | | | | 4 |
| | 19FP4 | A | −1 | C | D2 | | | | | | |
| | 19GP4 | A | −1½ | C | | | | | | | |
| | 20BP4 | A | +6 | C | | E | | | | | |
| | Also 16″ types listed under 16GP4 with 5″ decrease in length differential. | | | | | | | | | | |

□ Indicates rectangular tubes.

**SAFETY FIRST: Wear goggles and gloves when handling Picture Tubes. Be sure power supply is turned off before working on high-voltage circuits.**

## NOTES FOR PICTURE TUBE SUBSTITUTION CHART

A. Make adjustment for different bulb diameter or shape.

B. Number of inches the replacement tube is longer (+) or shorter (−) than the original tube.

C. Change anode connector to type required for the substitute tube.

D. Add or change permanent magnet type ion trap magnet. D1 indicates single field and D2 double field type required. When no change is indicated by notes D or E the type of ion trap magnet used on the original tube should be used.

E. Remove the ion trap magnet. If the ion trap magnet is the permanent magnet type, just remove it with the tube; if it is the coil type magnet leave it in the circuit and put it somewhere in the cabinet, out of the way, so that no circuit changes will be necessary.

F. Suggested only if the operating conditions of the receiver do not exceed the maximum ratings of the substitute tube.

G. Requires change of deflection yoke to 70° type and possibly a new horizontal output transformer and/or tube.

H. Change in picture tube socket is required.

K. Original tube had an external coating which provided a high voltage filter capacitor. Additional external capacitance may be required to replace that normally supplied by the original picture tube.

(1) Increase in power supply voltage may be necessary for optimum performance.

(2) May be used only when no potential is required between heater and cathode.

(4) Replacement type has coating on bulb which provides filter capacitance. Be sure this coating is grounded. The underwriter's safety code requires that the total high voltage filter capacity be limited to 2000 μμf at the usual operating voltage. The original filter capacitance should be disconnected in most cases.

(6) Substitution of a metal cone tube for a coated glass tube may also require rearrangement of any parts near the metal cone to prevent corona discharge and removal of any contacts formerly grounding the bulb coating. Additional insulation is usually necessary at the cone lip since a wood cabinet alone is not sufficient to protect the user.

(7) Substitution of a short-neck, wide-angle picture tube for a long-neck tube may require a change in focus coil and/or deflection coil.

(8) Substitution of tetrode types for this triode type requires the addition of a 250-300 volt source of accelerator voltage. A voltage divider drawing 25 μa is a possible solution.

☐ Indicates rectangular tubes.

**SAFETY FIRST: Wear goggles and gloves when handling Picture Tubes. Be sure power supply is turned off before working on high-voltage circuits.**

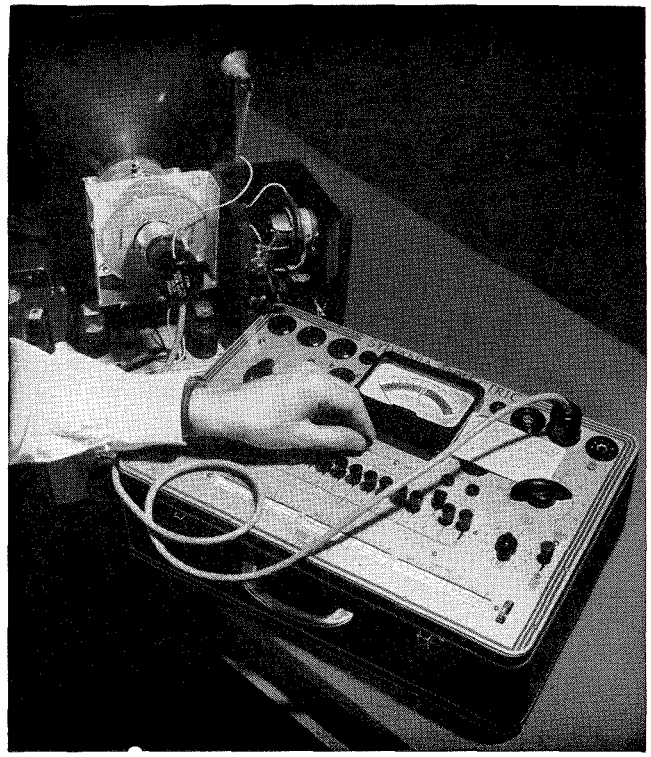
# SYLVANIA CATHODE RAY TUBE TEST ADAPTOR

Standard procedure for testing television picture tubes today consists of the old-fashioned substitution method. That can all be changed if you own a Sylvania Tube Tester Model 139, 140, 219 or 220 and a Sylvania 228 CR Tube Test Adaptor. With this combination, all of the commonly used 10 to 19 inch magnetic types* can be checked.

By placing your Sylvania tube tester close to the chassis, the picture tube need not be removed from the cradle—a real time saver in many sets. After making **sure** the set is turned **off**, the adaptor is plugged in according to the instructions with the unit and settings determined from the accompanying card. Since only a few hundred volts are available, as compared to 10,000 or more in the receiver, comparative readings are taken from the small numerical scale rather than on the "GOOD-BAD" scale.

There are a few picture tube defects, such as gas, that show up only with high voltage, but this tester will determine 85% of cases where the picture tube should be replaced. Shorts, leakage, open circuits, and relative emission are easily determined. Most other defects, such as a damaged screen coating, can be determined by observing the picture.

The socket provided is the almost universal duodecal. Test settings are provided for such popular tubes as 10BP4, 10FP4, 12KP4, 12LP4, 14BP4, 14CP4, 16AP4, 16GP4, 16JP4, 16LP4, 16RP4, 16TP4, 16WP4, 16ZP4, 17AP4, 17BP4, 17CP4, 19AP4, 20CP4, 20DP4 and any A or B versions of these.

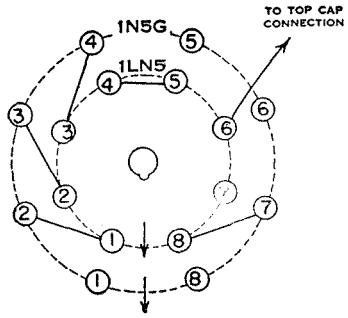


*Will not test electrostatic deflection type tubes or tubes with no accelerating electrode, such as the 10MP4 and 12VP4.

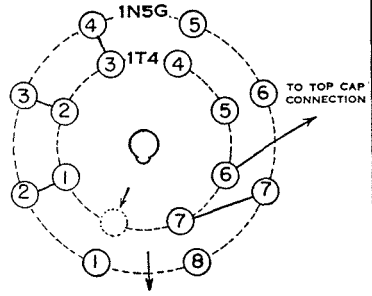
# ADAPTOR CIRCUITS COMMONLY REQUIRED

## AMPLIFIERS

TYPE 1LN5 REPLACING TYPE 1N5G

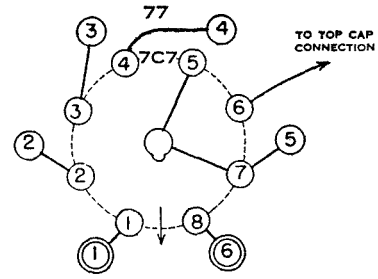



TYPE 1T4 REPLACING TYPE 1N5G



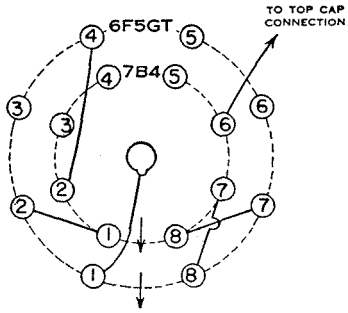

TYPE 7C7★ REPLACING TYPE {77, 6C6}

TYPE {7A7, 7B7★} REPLACING TYPE {78, 6D6}

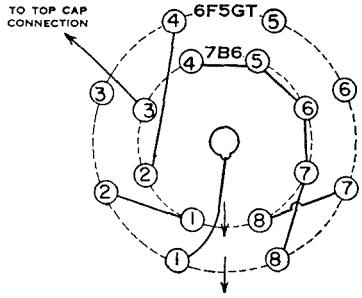



★ REQUIRES 42 TO 50 OHMS ACROSS HEATERS IN AC-DC SETS.

TYPE 7B4 REPLACING TYPE 6F5GT




TYPE {7B6, 7C6★} REPLACING TYPE 6F5GT

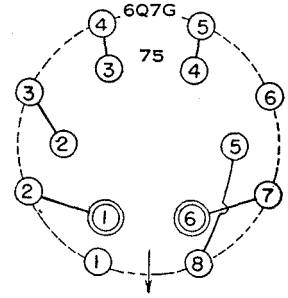



★ REQUIRES 42 TO 50 OHMS ACROSS HEATERS IN AC-DC SETS.

TYPE 75 REPLACING TYPE 6Q7G

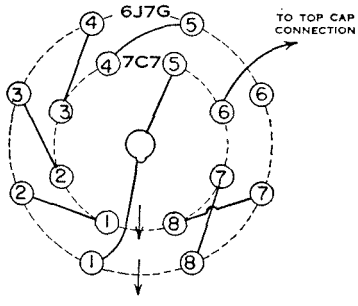
TYPE 43 REPLACING TYPE 25L6

TYPE {41, 42} REPLACING TYPE {6F6, 6K6, 6U6, 6V6}




TYPE {7C7★, 7L7} REPLACING TYPE 6J7GT

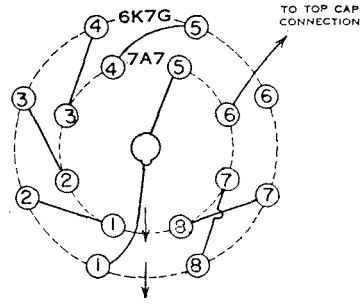
TYPE {14C7, 7C7} REPLACING TYPE 12J7GT




★ REQUIRES 42 TO 50 OHMS ACROSS HEATERS IN AC-DC SETS.

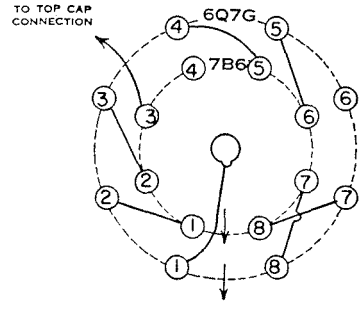
TYPE {7H7, 7A7} REPLACING TYPE 6K7GT

TYPE {14H7, 14A7} REPLACING TYPE 12K7GT




TYPE {7B6, 7C6★} REPLACING TYPE 6Q7GT

TYPE {7C6, 14B6} REPLACING TYPE 12Q7GT



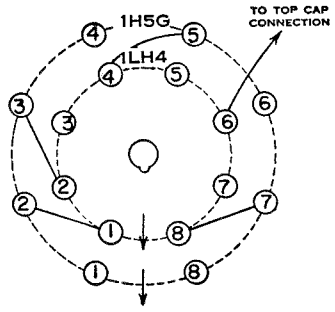

★ REQUIRES 42 TO 50 OHMS ACROSS HEATERS IN AC-DC SETS.

INNER CIRCLES REPRESENT THE PINS OF THE TYPE OF TUBE AVAILABLE FOR USE IN THE SOCKET WIRED FOR THE TYPE SHOWN AS THE OUTER CIRCLE. THE SOLID LINES SHOW THE WIRING FOR EITHER AN ADAPTOR OR FOR RECONNECTING TO THE SAME OR TO DIFFERENT SOCKETS.

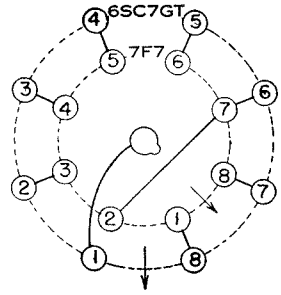
# ADAPTOR CIRCUITS COMMONLY REQUIRED

AMPLIFIERS CONT'D

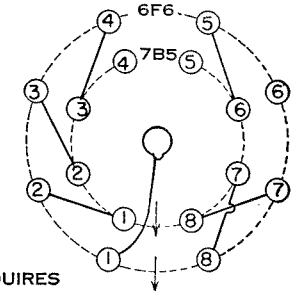
TYPE 1LH4 REPLACING TYPE 1H5GT




TYPE 7F7 REPLACING TYPE 6SC7GT

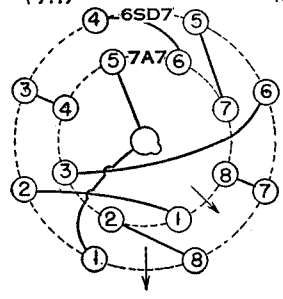



TYPE 1LA4 REPLACING TYPE 1A5G
TYPE 35A5 REPLACING TYPE 35L6
TYPE 50A5 REPLACING TYPE 50L6GT
TYPE 14C5 * REPLACING TYPE { 25L6G / 25A6G }
TYPE { 7A4 / XXL } REPLACING TYPE 6C5GT
TYPE 7B5 REPLACING TYPE { 6F6 / 6K6 / 6U6 / 6V6 }



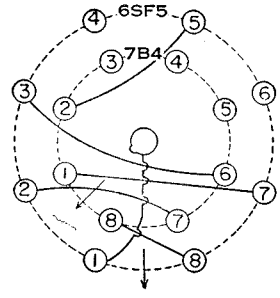

★ REQUIRES 175 OHMS ACROSS HEATERS IN AC-DC SETS AND 42 OHMS IN SERIES STRING.

TYPE { 7C7 / 14C7 } REPLACING TYPE { 12SJ7GT / 6SJ7GT ★ }
TYPE { 14H7 / 14A7 } REPLACING TYPE 12SK7GT
TYPE { 7A7 / 7H7 } REPLACING TYPE { 6SD7GT / 6SK7GT }

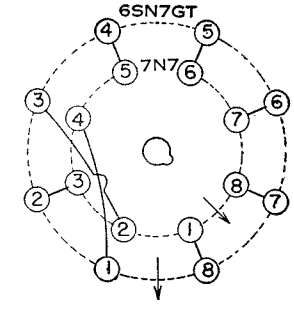



★ REQUIRES 42 TO 50 OHMS ACROSS HEATERS IN AC-DC SETS.

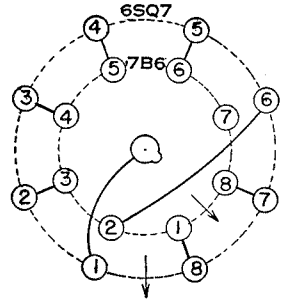
TYPE 7B4 REPLACING TYPE 6SF5



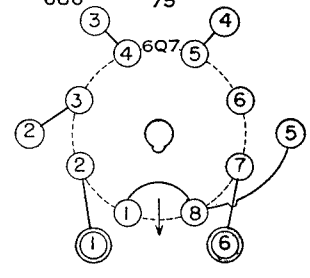

TYPE 7N7 REPLACING TYPE 6SN7GT



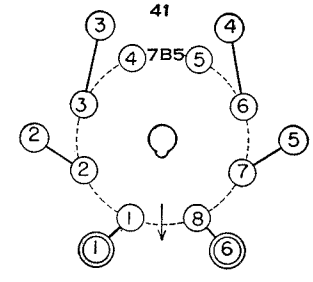

TYPE 7B6 REPLACING TYPE 6SQ7
TYPE 14B6 REPLACING TYPE 12SQ7




TYPE 6Q7GT REPLACING TYPE 75
TYPE 25L6 REPLACING TYPE 43
TYPE { 6K6 / 6V6 / 6F6 / 6U6 } REPLACING TYPE { 41 / 42 }




TYPE 7B5 REPLACING TYPE { 41 / 42 }



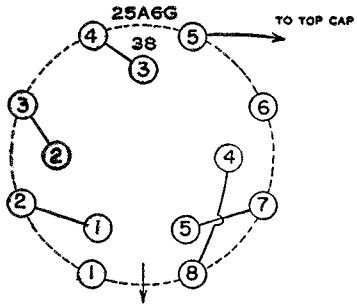

INNER CIRCLES REPRESENT THE PINS OF THE TYPE OF TUBE AVAILABLE FOR USE IN THE SOCKET WIRED FOR THE TYPE SHOWN AS THE OUTER CIRCLE. THE SOLID LINES SHOW THE WIRING FOR EITHER AN ADAPTOR OR FOR RECONNECTING TO THE SAME OR TO DIFFERENT SOCKETS.

SYLVANIA

# ADAPTOR CIRCUITS COMMONLY REQUIRED

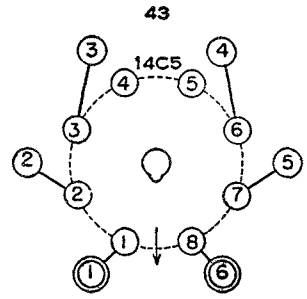
## AMPLIFIERS CONT'D

### TYPE 38 REPLACING TYPE 25A6G



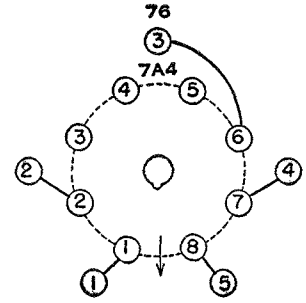

ADD 70 OHMS IN SERIES WITH HEATER IN AC-DC SETS.

### TYPE 14C5 REPLACING TYPE 43



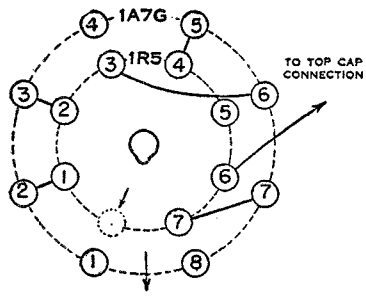

REQUIRES
175 OHMS ACROSS HEATERS IN AC-DC SETS AND 42 OHMS IN SERIES STRING.

### TYPE 7A4 / XXL REPLACING TYPE 76



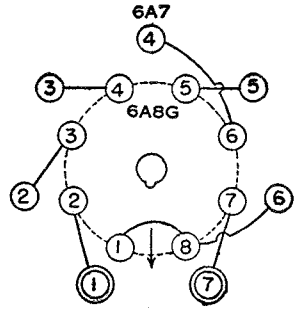

## CONVERTERS

### TYPE 1R5 REPLACING TYPE 1A7G

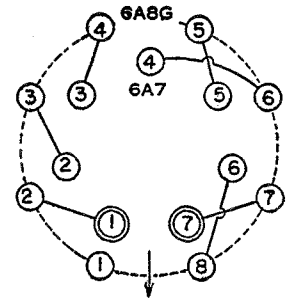



IN SOME LOCATIONS SENSITIVITY MAY BE TOO LOW FOR AVAILABLE SIGNAL STRENGTH.

### TYPE 6K8G / 6J8G / 6A8G REPLACING TYPE 6A7

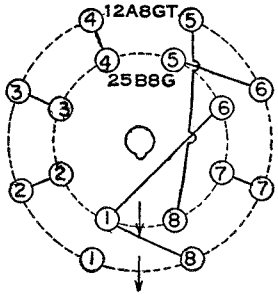



### TYPE 6A7 REPLACING TYPE 6A8G



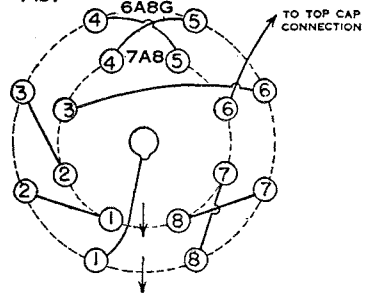

### TYPE 25B8GT REPLACING TYPE 12A8GT

### TYPE 12B8GT REPLACING TYPE 6A8G




### TYPE 7B8 / 7A8 ★ / 7J7 REPLACING TYPE 6A8G / 6J8G / 6K8G

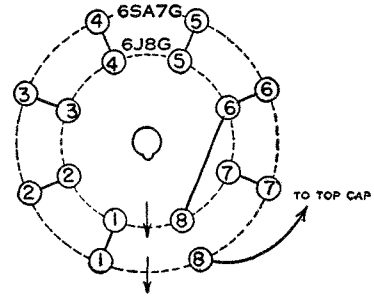
### TYPE 7A8 / 14B8 / 14J7 REPLACING TYPE 12A8GT / 12K8G




★ REQUIRES 42 TO 50 OHMS ACROSS HEATERS IN AC-DC SETS.

### TYPE 6J8G / 6A8G REPLACING TYPE 6SA7GT

### TYPE 12K8G REPLACING TYPE 12SA7GT

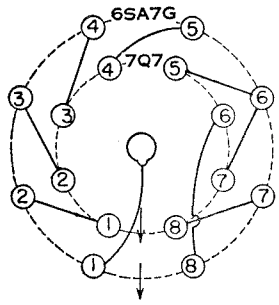



INNER CIRCLES REPRESENT THE PINS OF THE TYPE OF TUBE AVAILABLE FOR USE IN THE SOCKET WIRED FOR THE TYPE SHOWN AS THE OUTER CIRCLE. THE SOLID LINES SHOW THE WIRING FOR EITHER AN ADAPTOR OR FOR RECONNECTING TO THE SAME OR TO DIFFERENT SOCKETS.

# ADAPTOR CIRCUITS COMMONLY REQUIRED

TYPE 7Q7 REPLACING TYPE 6SA7GT

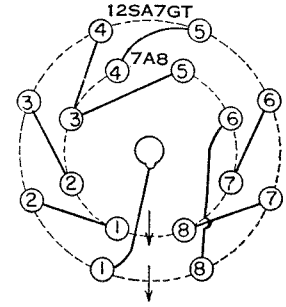
TYPE 14Q7 REPLACING TYPE 12SA7




CONVERTERS CONT'D

TYPE {7A8 / 14B8} REPLACING TYPE 12SA7GT

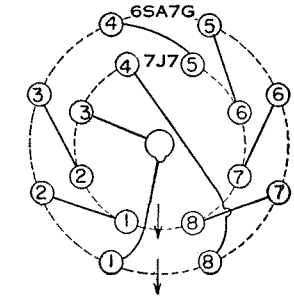
TYPE {7B8 / 7A8 ★} REPLACING TYPE 6SA7GT




★ REQUIRES 42 TO 50 OHMS ACROSS HEATERS IN AC-DC SETS.

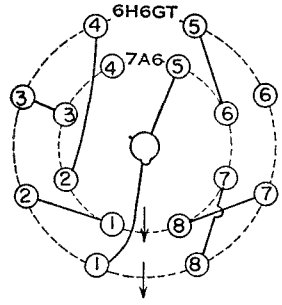
TYPE {14S7 / 14J7} REPLACING TYPE 12SA7GT

TYPE {7S7 / 7J7} REPLACING TYPE 6SA7GT



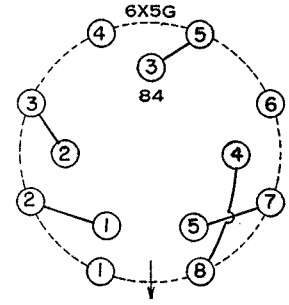

RECTIFIERS

TYPE 7A6 REPLACING TYPE 6H6GT

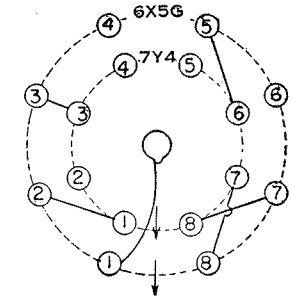



REQUIRES 42 TO 50 OHMS ACROSS HEATERS IN AC-DC SETS.

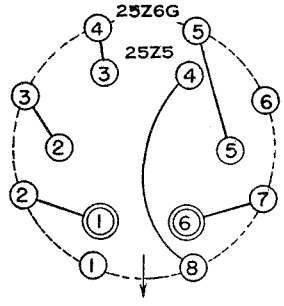
TYPE 84 REPLACING TYPE 6X5G



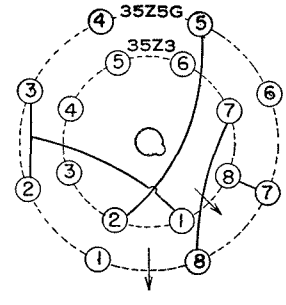

TYPE 7Y4 REPLACING TYPE 6X5G




TYPE 25Z5 REPLACING TYPE 25Z6G

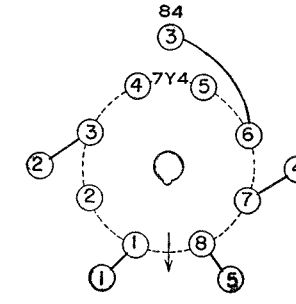



TYPE 35Z3 REPLACING TYPE 35Z5GT/G




OTHER PROVISION NECESSARY FOR PILOT LAMP.

TYPE 7Y4 REPLACING TYPE 84




INNER CIRCLES REPRESENT THE PINS OF THE TYPE OF TUBE AVAILABLE FOR USE IN THE SOCKET WIRED FOR THE TYPE SHOWN AS THE OUTER CIRCLE. THE SOLID LINES SHOW THE WIRING FOR EITHER AN ADAPTOR OR FOR RECONNECTING TO THE SAME OR TO DIFFERENT SOCKETS.