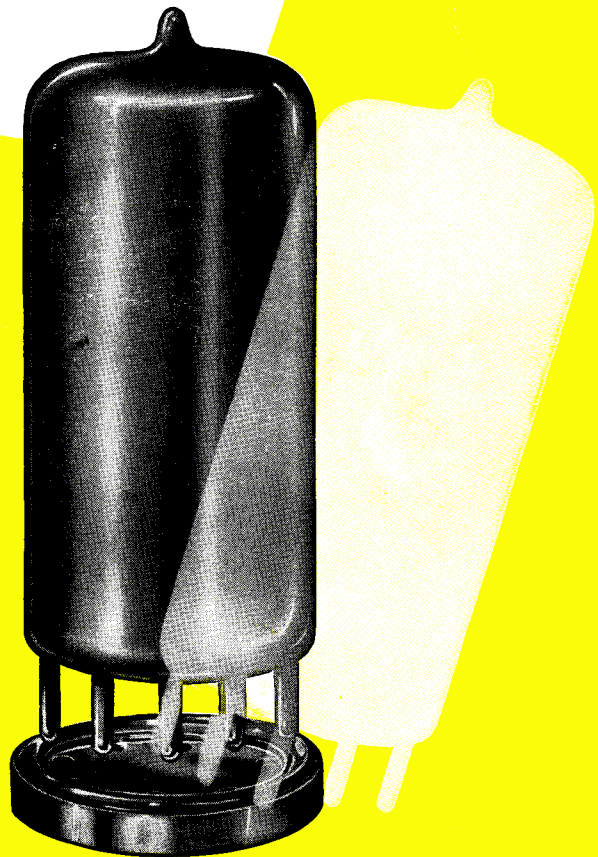


SYLVANIA

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

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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)					Type	Ef	If	Style	Gm	AMPLIFIERS (SHARP CUT-OFF RF)				
Pentodes — Tetrodes					6U7G	6.3	0.30	ST-12	1500	Pentodes — Tetrodes				
Type	Ef	If	Style	Gm	Type	Ef	If	Style	Gm	Type	Ef	If	Style	Gm
1A4P	2.0	0.06	ST-12	625 725	7A7	6.3	0.30	Lock-in	2350 2000	1AE4	1.25	0.10	Min.	1550
1A4T	2.0	0.06	ST-12	625 650	7AH7	6.3	0.15	Lock-in	3300	1AF4	1.4	0.025	Min.	825 950
1AB5	1.2	0.13	Lock-in	1100 1350	7B7	6.3	0.15	Lock-in	1675 1750	1B4P	2.0	0.06	ST-12	560 650
1D5GP	2.0	0.06	ST-12	625 725	7H7	6.3	0.30	Lock-in	4000	1E5GP	2.0	0.06	ST-12	560 650
1D5GT	2.0	0.06	ST-12	625 650	7T7	6.3	0.3	Lock-in	4900 4000	1L4	1.4	0.05	Min.	925 1025
1P5GT	1.4	0.05	GT	750	12BA6	12.6	0.15	Min.	4300 4400	1LC5	1.4	0.05	Lock-in	750 775
1SA6GT	1.4	0.05	GT	750 950 970	12BD6	12.6	0.15	Min.	2000 2350	1LG5	1.4	0.05	Lock-in	800 800 1050
1T4	1.4	0.05	Min.	700 900	12K7GT	12.6	0.15	GT	2350 2000	1LN5	1.4	0.05	Lock-in	800
6AB7	6.3	0.45	Metal	3500	12SG7	12.6	0.15	Metal	4100 4700	1N5GT	1.4	0.05	GT	750
6BA6	6.3	0.30	Min.	4200 4400	12SK7/GT	12.6	0.15	Metal/GT	4000 2300 2000	1U4	1.4	0.05	Min.	900
6BD6	6.3	0.30	Min.	2000 2350	14A7	12.6	0.15	Lock-in	2350 2000	3E6	1.4	0.10	Lock-in	2100 1800
6BJ6	6.3	0.15	Min.	3600 3650	14H7	12.6	0.15	Lock-in	4000	6AC7	6.3	0.45	Metal	6750
6D6	6.3	0.30	ST-12	1500 1600	26A6	26.5	0.07	Min.	2000 4000	6AG5	6.3	0.30	Min.	4750 5100 5000
6E7	6.3	0.30	ST-12	1500 1600	34	2.0	0.06	ST-14	560 600 620	6AH6	6.3	0.45	Min.	9000
6K7/G	6.3	0.30	Metal/ST-12	1650 1450	35/51	2.5	1.75	ST-14	1020 1050	6AJ5	6.3	0.175	Min.	2750
6K7GT	6.3	0.30	GT	1650 1450	35S/51S	2.5	1.75	ST-14	1020 1050	6AK5	6.3	0.175	Min.	5000 4300 5100
6R6G	6.3	0.3	ST-12	1160	39/44	6.3	0.30	ST-12	960 1000 1050	6AM6	6.3	0.30	Min.	7500
6S7/G	6.3	0.15	Metal/ST-12	1250 1750	58/58S	2.5	1.0	ST-12	1500 1600	6AS6	6.3	0.175	Min.	3500
6SD7GT*	6.3	0.30	GT	3350 3600	58AS	6.3	0.40	ST-12	1500 1600	6AU6	6.3	0.30	Min.	3900 4450 5200
6SG7*	6.3	0.30	Metal	4100 4700 4000	78	6.3	0.30	ST-12	1275 1100 1450	6BC5	6.3	0.30	Min.	4900 6100 5700
6SG7GT*	6.3	0.30	GT	4100 4700 4000	5590*	6.3	0.15	Min.	2000	6BH6	6.3	0.15	Min.	3400 4600
6SK7/GT	6.3	0.30	Metal/GT	2350 2000	5725	6.3	0.175	Min.		6C6	6.3	0.30	ST-12	1185 1225
6SS7	6.3	0.15	Metal	1950 1850	9001*	6.3	0.15	Min.	1400	6CB6	6.3	0.30	Min.	6200
					*Semi-remote					6D7	6.3	0.30	ST-12	1185 1225
										6J7	6.3	0.30	Metal	1225
										6J7G	6.3	0.30	ST-12	1225

SYLVANIA SUBSTITUTION MANUAL

Amplifiers (Sharp cut-off RF) Cont'd					CONVERTERS					DIODE DETECTORS				
Type	Ef	If	Style	Gm	Type	Ef	If	Style	Gc	Single and Double				Output
										Type	Ef	If	Style	Current
6J7GT	6.3	0.30	GT	1225	1A6	2.0	0.06	ST-12	275	1A3	1.4	0.150	Min.	0.5
6SE7GT	6.3	0.30	GT	3100	1A7GT	1.4	0.05	GT	250	1R4	1.4	0.150	Lock-in	1.0
6SH7	6.3	0.30	Metal	4000	1B7GT	1.4	0.10	GT	350	2S/4S	2.5	1.35	ST-12	40.0
6SH7GT	6.3	0.30	GT	4900	1C6	2.0	0.12	ST-12	300	6AL5	6.3	0.30	Min.	9.0
6SJ7/GT	6.3	0.30	Metal/GT	1575	1C7G	2.0	0.12	ST-12	300	6AN6	6.3	0.20	Min.	8.0
6W7G	6.3	0.15	ST-12	1650	1C8	1.25	0.04	T-3	100	6BC7	6.3	0.45	T-6 $\frac{1}{2}$	12.0
7AB7	6.3	0.15	Lock-in	1800	1D7G	2.0	0.06	ST-12	275	6H4GT	6.3	0.15	GT	4.0
7AD7	6.3	0.60	Lock-in	9500	1L6	1.4	0.05	Min.	300	6H6/GT	6.3	0.30	Metal/GT	8.0
7AG7	6.3	0.15	Lock-in	4200	1LA6	1.4	0.05	Lock-in	250	7A6	6.3	0.15	Lock-in	8.0
7AJ7	6.3	0.3	Lock-in	2275	1LB6	1.4	0.05	Lock-in	100	7C4	6.3	0.15	Lock-in	5.0
7AK7	6.3	0.8	Lock-in	1575	1LC6	1.4	0.05	Lock-in	250	12AL5	12.6	0.15	Min.	9.0
7C7	6.3	0.15	Lock-in	6500	1R5	1.4	0.05	Min.	275	12H6	12.6	0.15	Metal	8.0
7G7	6.3	0.45	Lock-in	1225	1U6	1.4	0.025	Min.	235	5679	6.3	0.15	Lock-in	8.0
7L7	6.3	0.30	Lock-in	1300	2A7/2A7S	2.5	0.80	ST-12	300	5726	6.3	0.30	Min.	9.0
7V7	6.3	0.45	Lock-in	4500	2A7/2A7S	2.5	0.80	ST-12	260	9006	6.3	0.15	Min.	5.0
7W7	6.3	0.45	Lock-in	3000	6A7/6A7S	6.3	0.30	ST-12	275					
12AU6	12.6	0.15	Min.	3100	6A7/6A7S	6.3	0.30	ST-12	360	DIODE-PENTODES				
				5800	6A8	6.3	0.30	Metal	550	Type	Ef	If	Style	Gm
				5800	6A8G	6.3	0.30	ST-12	360	1AF5	1.4	0.025	Min.	500
12AW6	12.6	0.15	Min.	3900	6A8GT	6.3	0.30	GT	360	1F6	2.0	0.06	ST-12	650
				4450	6AN7	6.3	0.23	T-6 $\frac{1}{2}$	550	1F7G	2.0	0.06	ST-12	650
				5200	6BA7	6.3	0.30	T-6 $\frac{1}{2}$	360	1F7GV	2.0	0.06	ST-12	650
				5000	6BE6	6.3	0.30	Min.	550	1LD5	1.4	0.05	Lock-in	550
				5100	6D8G	6.3	0.15	ST-12	750	1N6G	1.4	0.05	GT	575
				4750	6J8G	6.3	0.30	ST-12	900	1S5	1.4	0.05	Min.	625
12J7GT	12.6	0.15	GT	1225	6K8	6.3	0.30	Metal	950	1SB6GT	1.4	0.05	GT	500
12SH7/GT	12.6	0.15	Metal/GT	4000	6K8G/GT	6.3	0.30	ST-12/GT	455	1U5	1.4	0.05	Min.	625
				4900	6L7	6.3	0.30	Metal	475	2B7/2B7S	2.5	0.80	ST-12	950
12SJ7	12.6	0.15	Metal	1575	6L7G	6.3	0.30	ST-12	350*	6B8/G	6.3	0.30	Metal/ST-12	950
12SJ7GT	12.6	0.15	GT	1650	7A8	6.3	0.15	Lock-in	375	6B8GT	6.3	0.30	GT	950
14C7	12.6	0.15	Lock-in	1575	7B8	6.3	0.3	Lock-in	550	6N8	6.3	0.30	T-6 $\frac{1}{2}$	2200
14W7	12.6	0.225	Lock-in	2275	7J7	6.3	0.30	Lock-in	280	6SF7	6.3	0.30	Metal	1975
15	2.0	0.22	ST-12	1575	7Q7	6.3	0.30	Lock-in	290	6SV7	6.3	0.30	Metal	3600
22	3.3	0.132	ST-14	5800	7S7	6.3	0.30	Lock-in	525	7E7	6.3	0.30	Lock-in	1600
24A/24S	2.5	1.75	ST-14	710	12A8GT	12.6	0.15	GT	550	7R7	6.3	0.30	Lock-in	1300
				125	12BA7	12.6	0.15	T-6 $\frac{1}{2}$	900					2100
32	2.0	0.06	ST-14	1000	12BE6	12.6	0.15	Min.	950					3000
36	6.3	0.30	ST-12	1050	12K8	12.6	0.15	Metal	455					
				640	12K8GT	12.6	0.15	GT	475	DIODE TRIODES				
				650	12SA7	12.6	0.15	Metal	350	(DETECTOR-AMPLIFIER)				
EF50	6.3	0.30	Metal/Glass	1080	12SA7GT	12.6	0.15	GT	350	Single Diode Triode				
57/57S	2.5	1.0	ST-12	6300	12SY7	12.6	0.15	Metal	425	Duo Diode Triode				
57AS	6.3	0.40	ST-12	1185	14B8	12.6	0.15	Lock-in	450	Triple Diode Triode				
77	6.3	0.30	ST-12	1225	14J7	12.6	0.15	Lock-in	450	Type	Ef	If	Style	μ
				1100	14Q7	12.6	0.15	Lock-in	450	1B5	2.0	0.06	ST-12	20
1221	6.3	0.30	ST-12	1250	14S7	12.6	0.15	Lock-in	450	1H4G	2.0	0.06	ST-12	9.3
1223	6.3	0.30	ST-12	1185	26D6	26.5	0.07	Min.	425	1H5GT	1.4	0.05	GT	65
1229	2.0	0.06	ST-12	1225	FM1000	6.3	0.30	Lock-in	450	1H6G	2.0	0.06	ST-12	20
				1225	1612	6.3	0.30	Metal	360	1LH4	1.4	0.05	Lock-in	65
1231	6.3	0.45	Lock-in	5500						2A6	2.5	0.80	ST-12	100
				5000						6AQ6	6.3	0.15	Min.	70
1273	6.3	0.30	Lock-in	2275						6AQ7GT	6.3	0.30	GT	70
1280	12.6	0.15	Lock-in	1575						6AT6	6.3	0.30	Min.	70
				1575						6AV6	6.3	0.30	Min.	100
5591	6.3	0.15	Min.	5000						6AW7GT	6.3	0.30	GT	80
				4300						6B6G	6.3	0.30	ST-12	100
5654	6.3	0.175	Min.	5000						6BD7	6.3	0.23	T-6 $\frac{1}{2}$	70
5693	6.3	0.3	Metal	1650						6BF6	6.3	0.30	Min.	16
5847	6.3	0.3	T-6 $\frac{1}{2}$	12500						6BK6	6.3	0.30	Min.	100
5879	6.3	0.15	T-6 $\frac{1}{2}$	1000						6BT6	6.3	0.30	Min.	70
5901	1.4	0.05	Min.	900										
9003	6.3	0.15	Min.	1800										

*require separate oscillator

GENERAL TUBE CLASSIFICATIONS

Diode Triode (Continued)					Type	Ef	If	Style	μ	Type	Ef	If	Style	μ
Type	Ef	If	Style	μ	6V7G	6.3	0.30	ST-12	8.3	12SQ7/GT	12.6	0.15	Metal/GT	100
6BU6	6.3	0.30	Min.	16.5	7B6	6.3	0.30	Lock-in	100	12SR7	12.6	0.15	Metal	16
				16.0	7C6	6.3	0.15	Lock-in	85	12SW7	12.6	0.15	Metal	17
6C7	6.3	0.30	ST-12	20					100					16
6Q7	6.3	0.30	Metal	70	7E6	6.3	0.30	Lock-in	16	14B6	12.6	0.15	Lock-in	100
6Q7G	6.3	0.30	ST-12	70					16.5	14E6	12.6	0.15	Lock-in	16
6Q7GT	6.3	0.30	GT	70	7K7	6.3	0.30	Lock-in	70					16.5
6R7	6.3	0.30	Metal	16	7X7	6.3	0.30	Lock-in	85	14X7	12.6	0.15	Lock-in	85
6R7GT	6.3	0.30	GT	16					100					100
6R8	6.3	0.45	T-6½	16	12AT6	12.6	0.15	Min.	70	19C8	18.9	0.15	T-6½	100
6S8GT	6.3	0.30	GT	100	12AV6	12.6	0.15	Min.	100	19T8	18.9	0.15	Min.	70
6SQ7GT	6.3	0.30	GT	16	12BF6	12.6	0.15	Min.	16	26BK6	26.5	0.07	Min.	100
6SR7/GT	6.3	0.30	Metal/GT	16	12BK6	12.6	0.15	Min.	100	26C6	26.5	0.07	Min.	17
6ST7	6.3	0.15	Metal	16	12BT6	12.6	0.15	Min.	70					16
6SZ7	6.3	0.15	Metal	70	12BU6	12.6	0.15	Min.	16.5	55/55S	2.5	1.0	ST-12	8.3
6T7G	6.3	0.15	ST-12	65	12Q7GT	12.6	0.15	GT	70	75 or 75S	6.3	0.30	ST-12	100
6T8	6.3	0.45	T-6½	70	12S8GT	12.6	0.15	GT	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	6.3	0.30	GT	1600	70.0
6SL7WGT	6.3	0.30	GT		
6SN7GT	6.3	0.60	GT	3000	20.0
6SN7WGT	6.3	0.60	GT	2600	
6SU7GT	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	

Type	Ef	If	Style	Gm	μ
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	1.0
				4.0	4.0
6AB5/6N5	6.3	0.15	T-9	2.0	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
				4.0	3.0
6T5	6.3	0.15	ST-12		
6U5	6.3	0.30	T-9	1.0	4.0
				4.0	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.

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.

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.

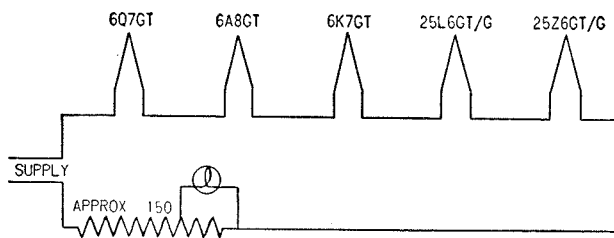


FIG. 1

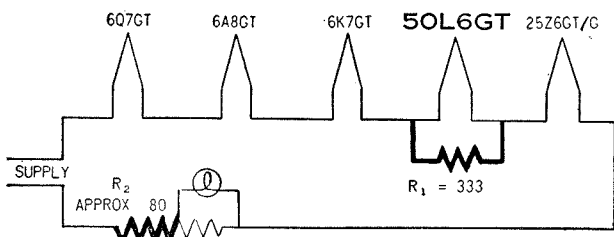


FIG. 2

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

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

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.

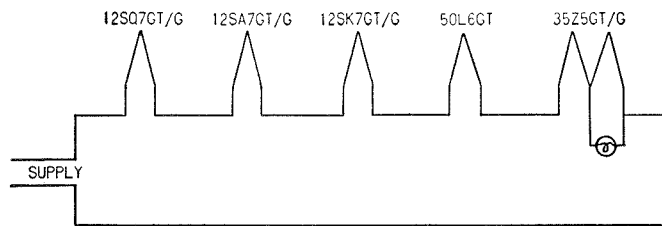


FIG. 3

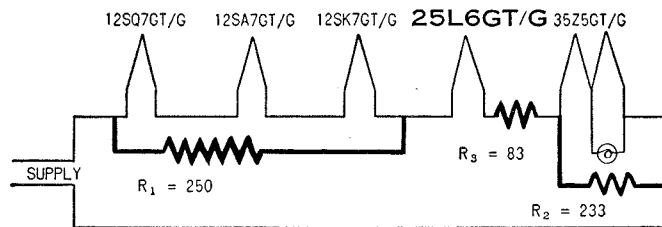


FIG. 4

$$R_1 \text{ or } R_2 = \frac{\text{Sum of tube voltages across resistor}}{.150}$$

$$R_3 = \frac{\text{Old tube volts—new tube volts}}{.300}$$

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.

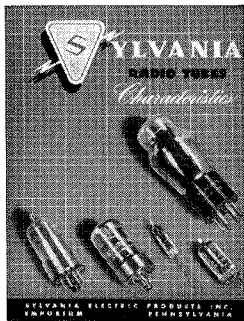
To summarize, when a 300 ma. tube is used to replace a 150 ma. tube, there are three things which must be observed:

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.

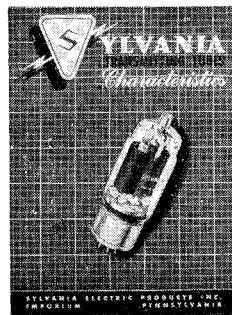
NOTES FOR BATTERY TYPES SUBSTITUTIONS

- 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.



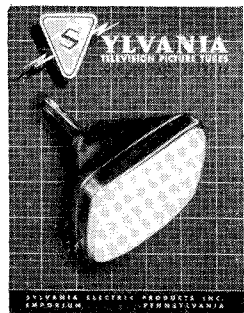
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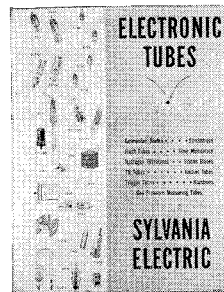
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SYLVANIA SUBSTITUTION MANUAL

For details of changes indicated
Refer to page 18

REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	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	F				4
	14C7		B			E	F				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	B	C	D	E	F	G	H	K	NOTE NO.

7A6	XXD		B		D						4
(Continued)	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	6AO6					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.

150 MA. SERIES HEATER TYPES

For details of changes indicated
Refer to page 18

REQUIRED TYPE	POSSIBLE REPLACEMENTS	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				H	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

For details of changes indicated
Refer to page 18

REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K
12K7GT	7B7		B			E	F		H	
(Continued)	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.

SYLVANIA SUBSTITUTION MANUAL

For details of changes indicated Refer to page 18

REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K
---------------	-----------------------	---	---	---	---	---	---	---	---	---

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				8
	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.

For details of changes indicated Refer to page 18

REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K
---------------	-----------------------	---	---	---	---	---	---	---	---	---

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.

SYLVANIA SUBSTITUTION MANUAL

For details of changes indicated Refer to page 18

REQUIRED TYPE	POSSIBLE REPLACEMENTS	NOTE NO.									
		A	B	C	D	E	F	G	H	K	
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							
	See also types under 50Y6GT for use as a half wave rectifier.										

For details of changes indicated Refer to page 18

REQUIRED TYPE	POSSIBLE REPLACEMENTS	NOTE NO.									
		A	B	C	D	E	F	G	H	K	
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.

SYLVANIA SUBSTITUTION MANUAL

For details of changes indicated Refer to page 18		NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN CAP. CONNECTION OR REMOVE TOP CAP CHANGE WTS. NOTE NO.									
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
6H6GT.....	7F7.....					E	F				4
(Continued)	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

For details of changes indicated Refer to page 18		NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN CAP. CONNECTION OR REMOVE TOP CAP CHANGE WTS. NOTE NO.									
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
6Q7GT.....	7E7.....					E			H		3
(Continued)	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.

300 MA. SERIES HEATER TYPES

For details of changes indicated Refer to page 18		<div style="display: flex; justify-content: space-between; font-size: small;"> NO CHANGES PL. VOLTS PL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN ADD CONNECTION REMOVE CONNECTION CHANGE BIAS VOLTS REMOVE BIAS VOLTS NOTE NO. </div>									
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
6U7G	39/44					E	F				
(Continued)	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					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				K 2-8	
	38	B				E	G			K 2	
	25C6G									K 2	
	32L7GT	B			D					9-2	
	25A7GT				D					9	
	12A7	B				E	G			9-2	

For details of changes indicated Refer to page 18		<div style="display: flex; justify-content: space-between; font-size: small;"> NO CHANGES PL. VOLTS PL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN ADD CONNECTION REMOVE CONNECTION CHANGE BIAS VOLTS REMOVE BIAS VOLTS NOTE NO. </div>									
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
25A6GT	Any type listed under 35A5 in 150 ma. chart may be used with simple resistor changed. (See article on page 8.)										
(Continued)											
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			K 2	
	25B6G									K 2	
	32L7GT		B		D					K 2-9	
	25A7GT				D					K 2-9	
	12A7		B			E	G			K 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.										

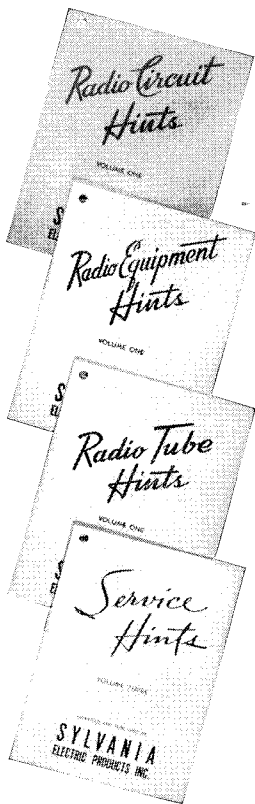
These substitutions are for AC-DC series sets. For transformer operated sets the above substitutions are possible if tubes requiring no voltage change are used. Substitutes from either the 150 or 300 ma. chart may be used.

SYLVANIA SUBSTITUTION MANUAL

For details of changes indicated Refer to page 18		NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN CAP CONNECTION REMOVE TOP CAP REMOVE TOP CONNECTION CHANGE BVS OP. PLATE TOP CONNECTION NOTE NO.									
REQUIRED TYPE	POSSIBLE REPLACEMENTS	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		NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN CAP CONNECTION REMOVE TOP CAP REMOVE TOP CONNECTION CHANGE BVS NOTE NO.									
REQUIRED TYPE	POSSIBLE REPLACEMENTS	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

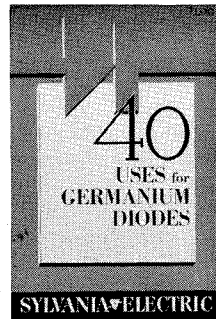


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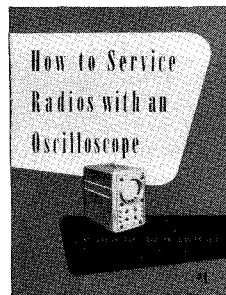
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These substitutions are for AC-DC series sets. For transformer operated sets the above substitutions are possible if tubes requiring no voltage change are used. Substitutes from either the 150 or 300 ma. chart may be used.

TRANSFORMER AND AUTO TYPES

For details of changes indicated Refer to page 18		<div style="display: flex; justify-content: space-between; font-size: small;"> NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN ADD CONNECTION CAP. CONNECTION OR REPAIR FOR 1.5 OR REPAIR FOR 1.5 NOTE NO. </div>									
REQUIRED TYPE	POSSIBLE REPLACEMENTS	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 82)					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						

For details of changes indicated Refer to page 18		<div style="display: flex; justify-content: space-between; font-size: small;"> NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN ADD CONNECTION CAP. CONNECTION OR REPAIR FOR 1.5 OR REPAIR FOR 1.5 NOTE NO. </div>									
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
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		E				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.

SYLVANIA SUBSTITUTION MANUAL

For details of changes indicated Refer to page 18		NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN 2-PIV CONNECTION OR 2-PIV CONNECTION CAP. CONNECTION CHANGE BITS NOTE NO.									
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
7C5	6V6GT					E					K 2
	6K6GT			C		E					K 2
	6F6G			C		E					K 2
	6U6GT			C		E					K 2
	7B5			C		E					K 2
	41			C		E					K 2
	42			C		E					K 2
7N7	6N7G			C		E					K
	6F8G			C		E					K
	6C8G			C		E		G			K
	6SN7GT					E					K
12A	01A										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					K
	6F6G			C		E					K
	6U6GT			C		E					K 2
	6B5			C							K
	6N6G			C		E					K
	7A5			C		E					K 2
	7B5			C		E					8
	7C5			C		E					K
	6V6GT			C		E					K
42	41			C							K
	6K6G			C		E					K
	6F6G			C		E					K
	6U6GT			C		E					K 2
	6B5			C							K
	6N6G			C		E					K
	7A5			C		E					K 2
	7B5			C		E					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					K
	35/51			C		E					K
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		NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN 2-PIV CONNECTION OR 2-PIV CONNECTION CAP. CONNECTION CHANGE BITS NOTE NO.									
REQUIRED TYPE	POSSIBLE REPLACEMENTS	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			C							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						K
	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						K
	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.

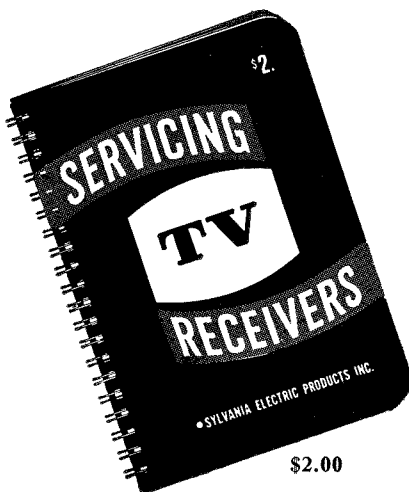
HORIZONTAL OSCILLATOR: In general, this is a very difficult circuit to readjust for a substitute tube. Since this tube is used in the AFC circuit any change in current or bias could completely upset the tuning adjustments.

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.

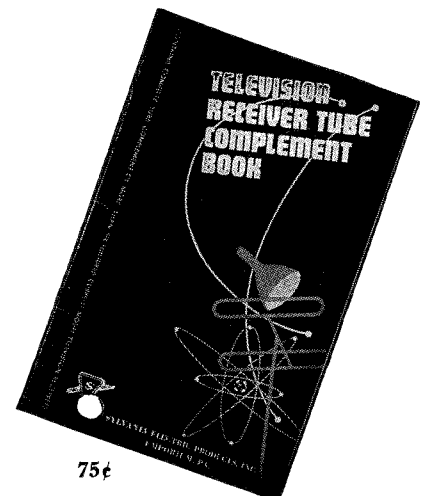


205 Television Servicing Book-Vol.II

The biggest "little" book ever printed for the television serviceman. Contains page after page of handy reference for the causes and corrections for faulty reception in TV receiving sets. Profusely illustrated, complete with circuit diagrams, that save guessing and suggestions that save time and make more money, quicker, for you! Handy pocket size, 5" x 7".

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SYLVANIA SUBSTITUTION MANUAL

For details of changes indicated Refer to page 28		<div style="display: flex; justify-content: space-between; font-size: small;"> NO CHANGES PL. VOLTS PL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN ADD CONNECTION REMOVE CONNECTION CHANGE WTS. OF PLATE OR GRID REMOVE OR ADD CONNECTION CHANGE BIAS PL. VOLTS </div>										NOTE NO.
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K		
1B3GT	1X2 (A) 1Y2 5642					E					13	
1V2	1B3GT 1X2 (A) 5642 1Y2	B	C			E		G				
1X2 (A)	1V2 5642 1B3GT	B	C	D					H		13	
6AG5	6AK5 6BC5 6BH6 6AU6 6CB6 6AS6 12AU6 12AW6 5591 5654			C			F			K		
6AK5	6AG5 6BC5 6BH6 6AU6 6CB6 6AS6 12AU6 12AW6 5591 5654			C			F			K		
6AL5	12AL5 5726 6AQ7GT 6AW7GT 6BC7 6H6GT 7A6 14A6 12AT7 12AU7 12AV7 12AX7 12AY7 1N34 1N60	B	C									
6AQ5 (when used as a pentode or triode)	6AR5 5686 6V6GT 7C5 6BF5 6K6GT		C	D			E			K		
6AQ5 (when used as a triode only)	6SN7GT 6BF5 6W6GT 6S4 12BH7		C			E				K	22	
6AT6	6AQ6 6AQ7GT 6AV6 6AW7GT 6B6G 6BD7 6BK6 6BT6		C				E		G			

For details of changes indicated Refer to Page 28		<div style="display: flex; justify-content: space-between; font-size: small;"> NO CHANGES PL. VOLTS PL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN ADD CONNECTION REMOVE CONNECTION CHANGE BIAS PL. VOLTS </div>										NOTE NO.
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K		
6AU5GT	6AV5GT 6BG6G 6BQ6GT 6L6G (A) 807 (W) 6AL6G 6AH5G			C	D			G			23	
6AU6	Same as type 6AK5											
6AV5GT	6AU5GT 6BG6G 6BQ6GT 6L6G (A) 6AL6G 807 (W) 6AH5G			C	D			G			23	
6BC5	6AG5 6AK5 6AU6 6BH6 6CB6 6SH7GT 7AG7 5654 5591			C			F			K		
6BD5GT	6AU5GT 6AV5GT 6BG6G 6BQ6GT 6L6G (A) 807 (W)			C						K	6	
6BG6G	6CD6G 6BQ6GT 6AV5GT 6AU5GT 807 (W) 19BG6G 25BQ6GT			C	D		F				10	
6BQ6GT	6BG6G 6CD6G 6AU5GT 6AV5GT 807 (W) 19BG6G 25BQ6GT			C	D		F				7	
6CB6	6AK5 6AG5 6BC5 6BH6 6AU6 6AS6 12AU6 12AW6 5591 5654			C	D		F			K		
6CD6	6AU5GT 6BQ6GT 807 (W) 19BG6G 25BQ6GT 6BG6G 6AV5GT					E		G			12	

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

SYLVANIA SUBSTITUTION MANUAL

For details of changes indicated Refer to page 28		NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN ADD CONNECTION OR REMOVE TOP CAP OR CHANGE TOP VOLT CHANGE BIAS VOLT NOTE NO.									
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
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

For details of changes indicated Refer to Page 28		NO CHANGES FIL. VOLTS FIL. CURRENT REWIRE SOCKET CHANGE SOCKET REALIGN ADD CONNECTION OR REMOVE TOP CAP OR CHANGE TOP VOLT CHANGE BIAS VOLT NOTE NO.									
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
19BG6G.....	6BQ6GT.....		B	C	D		F				10-14
Continued)	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		BULB DIAMETER	BULB LENGTH	CONNECTOR	ADD ION TRAP WAG.	REMOVE ION TRAP WAG.	CHANGE COILS OPERATING	CHANGE REFLECTION	ADD FILTER CAPACITANCE	CHANGE TUBE SOCKET	NOTE NO.
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
3KP4.....	3GP1A.....									H	2
	3JP1.....		-1 1/2							H	
3NP4.....	None.....										
5BP4.....	5NP4.....	No changes									
	7EP4.....	A	-1 1/2								
5HP4.....	5NP4.....	No changes									
5TP4.....	None.....										
7DP4.....	10DP4.....	A	+3 1/2							K	
7EP4.....	5BP4-A.....	A	+1 1/2								
	7JP4.....		-1							H	
7GP4.....	7JP4.....	No changes									
	10HP4.....	A	+4 3/4								
	8BP4.....	A	+2								
7JP4.....	7GP4.....						F				
	10HP4.....	A	+4 3/4								
	8BP4.....	A	+2								
8AP4.....	10MP4.....	A	+2 3/4	C	D2						4, 1
	12VP4.....	A	+3 3/4	C	D2						4, 1
	10BP4.....	A	+3 1/2	C	D2						8, 4
	10FP4.....	A	+3 1/2	C		E					1, 8, 4
	12JP4.....	A	+3	C		E					8, 1
	12UP4.....	A	+4 1/2		D2						8, 1
9AP4.....	12AP4.....	A	+4 3/8								
10BP4.....	10CP4.....		-1	C		E					
	10FP4.....					E					
	12JP4.....	A		C						K	
	12KP4.....	A				E					

For details of changes indicated Refer to page 34		BULB DIAMETER	BULB LENGTH	CONNECTOR	ADD ION TRAP WAG.	REMOVE ION TRAP WAG.	CHANGE COILS OPERATING	CHANGE REFLECTION	ADD FILTER CAPACITANCE	CHANGE TUBE SOCKET	NOTE NO.
REQUIRED TYPE	POSSIBLE REPLACEMENTS	A	B	C	D	E	F	G	H	K	
10BP4.....	12LP4.....	A	+1								
(Continued)	12UP4.....	A	+1	C						K	6
	14BP4 □.....	A						G			
	14CP4 □.....	A	-1		D1			G			
10CP4.....	10BP4.....		+1	C	D2						
	10FP4.....		+1	C							
	12JP4.....	A	+ 1/2								
	12KP4.....	A	+1	C							
	12LP4.....	A	+1 3/4	C	D2						
	12UP4.....	A	+2	C	D2					K	6
	14BP4 □.....	A		C	D2			G			
	14CP4 □.....	A		C		E		G			
10DP4.....	7DP4.....	A	-3 1/2			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	-4 3/4			F					
	7JP4.....	A	-4 3/4			F					
	10GP4.....		-3/4								
	8BP4.....	A	-2 3/4								
10MP4.....	8AP4.....	A	-2 3/4	C	D1	F					6
	12VP4.....	A	+1		D1						1, 6
	Also 10" types under 10BP4 but add note										
											8
12AP4.....	9AP4.....	A	-4 1/4								
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.

SYLVANIA SUBSTITUTION MANUAL

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 μmf 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.

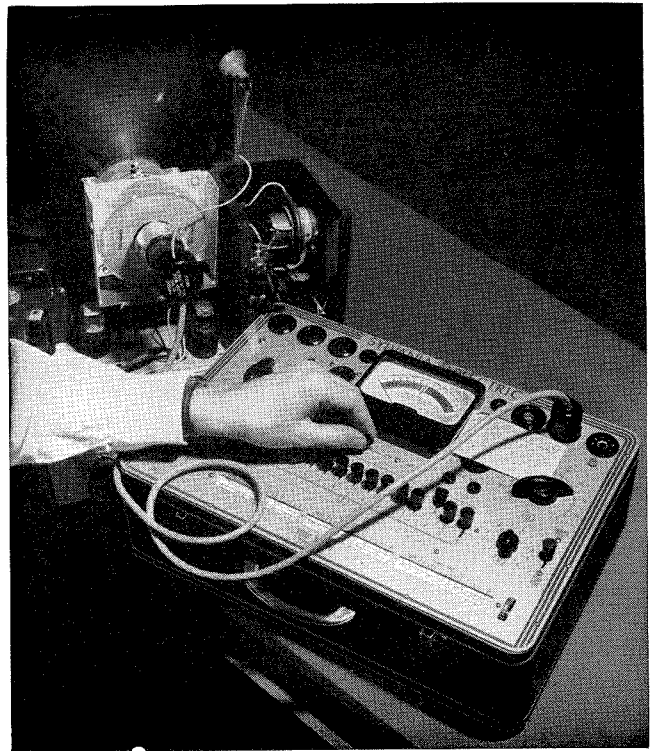
SYLVANIA CATHODE RAY TUBE TEST ADAPTOR

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.

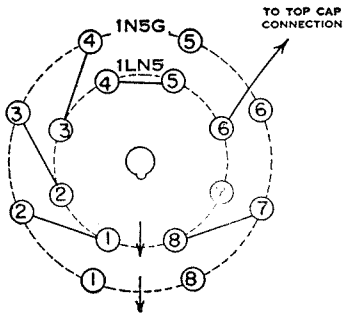


*Will not test electrostatic deflection type tubes or tubes with no accelerating electrode, such as the 10MP4 and 12VP4.

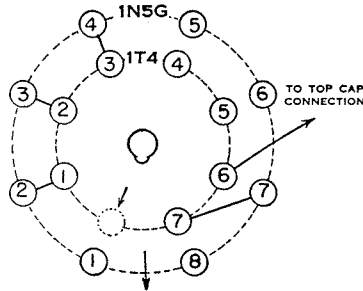
ADAPTOR CIRCUITS COMMONLY REQUIRED

AMPLIFIERS

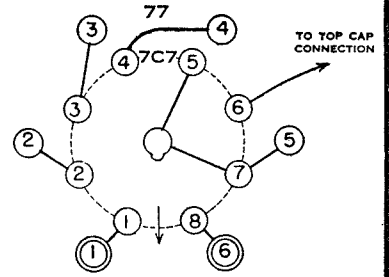
TYPE 1LN5 REPLACING TYPE 1N5G



TYPE 1T4 REPLACING TYPE 1N5G

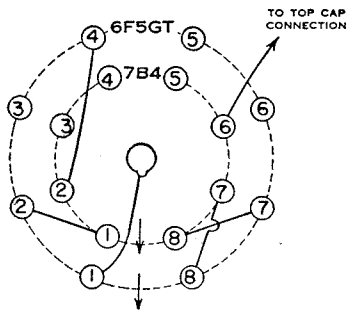


TYPE 7C7* REPLACING TYPE 77
TYPE 7A7 REPLACING TYPE 78
TYPE 7B7* REPLACING TYPE 78

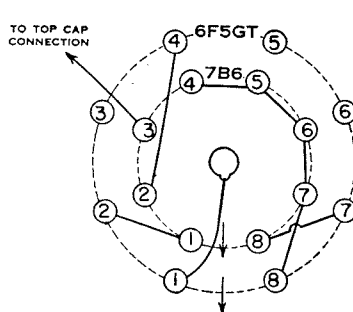


* REQUIRES 42 TO 50 OHMS ACROSS HEATERS IN AC-DC SETS.

TYPE 7B4 REPLACING TYPE 6F5GT

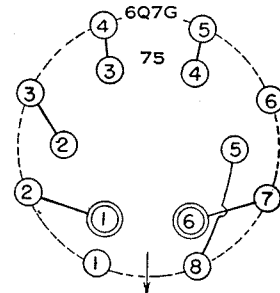


TYPE 7B6 REPLACING TYPE 6F5GT
TYPE 7C6*

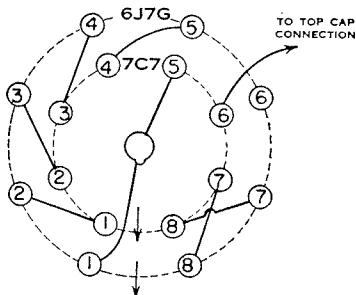


* REQUIRES 42 TO 50 OHMS ACROSS HEATERS IN AC-DC SETS.

TYPE 75 REPLACING TYPE 6Q7G
TYPE 43 REPLACING TYPE 25L6
TYPE 41 REPLACING TYPE 6F6
TYPE 42 REPLACING TYPE 6K6
6U6
6V6

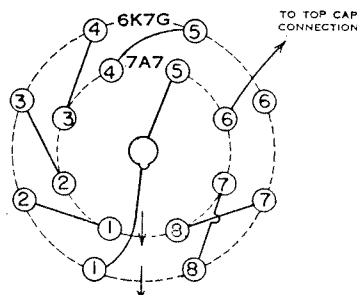


TYPE 7C7* REPLACING TYPE 6J7GT
TYPE 7L7
TYPE 14C7 REPLACING TYPE 12J7GT
TYPE 7C7 REPLACING TYPE 12J7GT

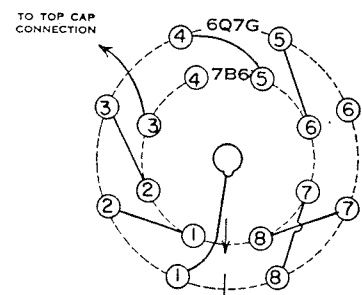


* REQUIRES 42 TO 50 OHMS ACROSS HEATERS IN AC-DC SETS.

TYPE 7H7 REPLACING TYPE 6K7GT
TYPE 7A7
TYPE 14H7 REPLACING TYPE 12K7GT
TYPE 14A7



TYPE 7B6 REPLACING TYPE 6Q7GT
TYPE 7C6* REPLACING TYPE 12Q7GT
TYPE 14B6



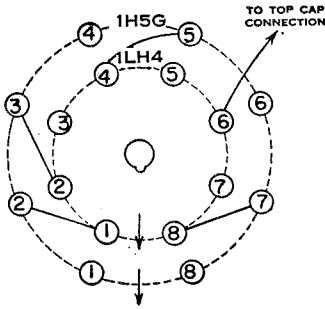
* REQUIRES 42 TO 50 OHMS ACROSS HEATERS IN AC-DC SETS.

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.

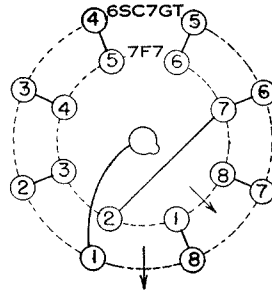
ADAPTOR CIRCUITS COMMONLY REQUIRED

AMPLIFIERS CONT'D

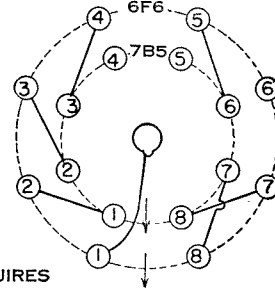
TYPE 1LH4 REPLACING TYPE 1H5GT



TYPE 7F7 REPLACING TYPE 6SC7GT

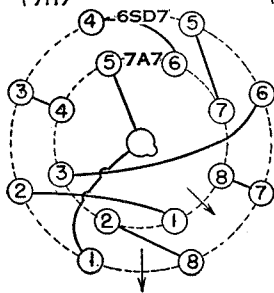


TYPE 1LA4 REPLACING TYPE 1A5G
 TYPE 35A5 REPLACING TYPE 35L6
 TYPE 50A5 REPLACING TYPE 50L6GT
 TYPE 14C5* REPLACING TYPE { 25L6G
 25A6G
 TYPE { 7A4 REPLACING TYPE 6C5GT
 XXL
 TYPE 7B5 REPLACING TYPE { 6F6
 6K6
 6U6
 6V6



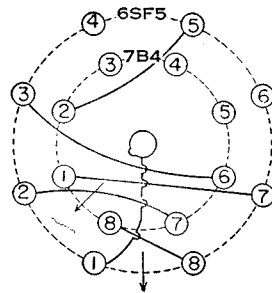
* REQUIRES
 175 OHMS ACROSS HEATERS IN AC-DC
 SETS AND 42 OHMS IN SERIES STRING.

TYPE { 7C7 REPLACING TYPE { 12SJ7GT
 14C7 6SJ7GT*
 TYPE { 14H7 REPLACING TYPE 12SK7GT
 14A7
 TYPE { 7A7 REPLACING TYPE { 6SD7GT
 7H7 6SK7GT

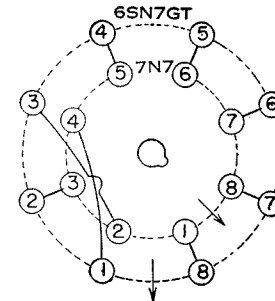


* REQUIRES 42 TO 50 OHMS ACROSS
 HEATERS IN AC-DC SETS.

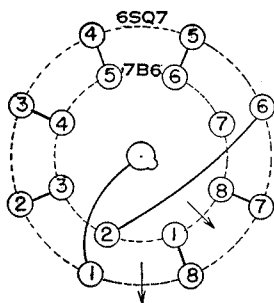
TYPE 7B4 REPLACING TYPE 6SF5



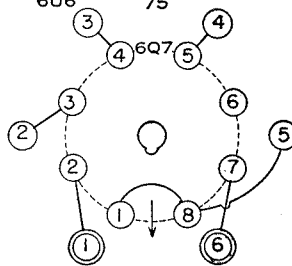
TYPE 7N7 REPLACING TYPE 6SN7GT



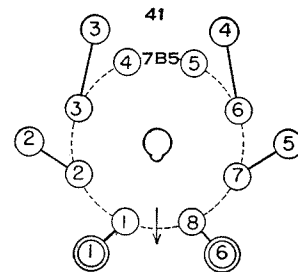
TYPE 7B6 REPLACING TYPE 6SQ7
 TYPE 14B6 REPLACING TYPE 12SQ7



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



TYPE 7B5 REPLACING TYPE { 41
 42

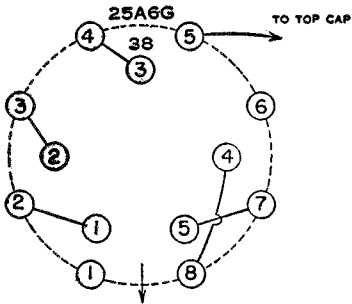


INNER CIRCLES REPRESENT THE PINS OF THE TYPE OF TUBE AVAILABLE FOR USE IN THE
 SOCKET WIRED FOR THE TYPE SHOWN AS THE OUTER CIRCLE. THE SOLID LINES SHOW THE
 WIRING FOR EITHER AN ADAPTOR OR FOR RECONNECTING TO THE SAME OR TO DIFFERENT SOCKETS.

ADAPTOR CIRCUITS COMMONLY REQUIRED

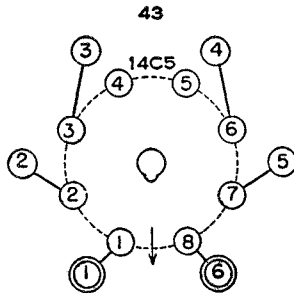
AMPLIFIERS CONTD

TYPE 38 REPLACING TYPE 25A6G



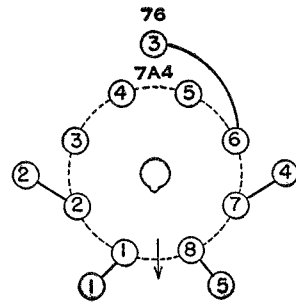
ADD 70 OHMS IN SERIES WITH HEATER IN AC-DC SETS.

TYPE 14C5 REPLACING TYPE 43

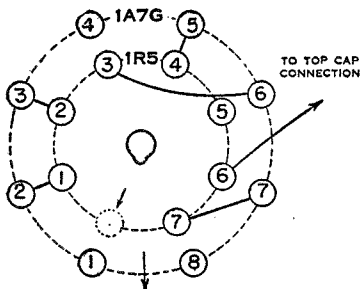


REQUIRES
175 OHMS ACROSS HEATERS IN AC-DC SETS AND 42 OHMS IN SERIES STRING.

TYPE 7A4
XXL REPLACING TYPE 76

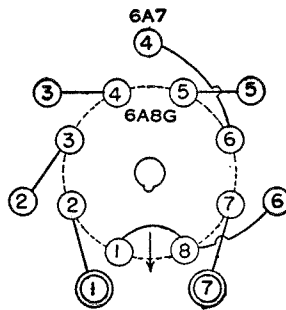


TYPE 1R5 REPLACING TYPE 1A7G

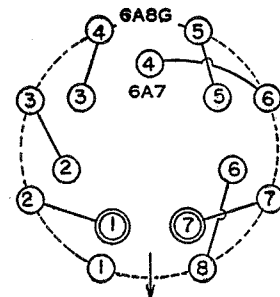


IN SOME LOCATIONS SENSITIVITY MAY BE TOO LOW FOR AVAILABLE SIGNAL STRENGTH.

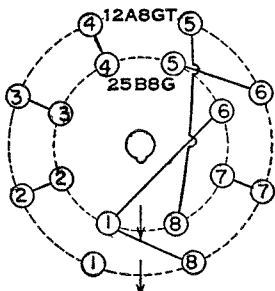
TYPE 6K8G
6J8G REPLACING TYPE 6A7
6A8G



TYPE 6A7 REPLACING TYPE 6A8G

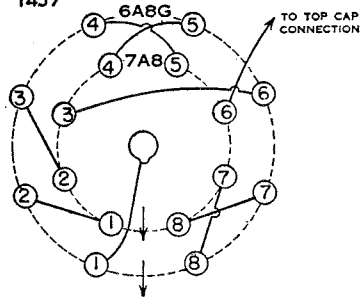


TYPE 25B8GT REPLACING TYPE 12A8GT
TYPE 12B8GT REPLACING TYPE 6A8G



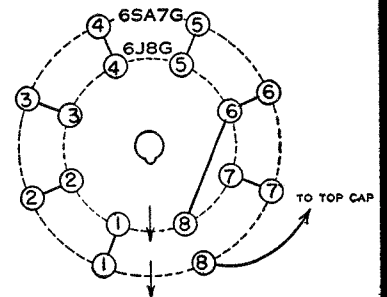
TYPE 7B8
7A8* REPLACING TYPE 6A8G
6J8G
6K8G
7J7

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



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

TYPE 6J8G
6A8G REPLACING TYPE 6SA7GT
TYPE 12K8G REPLACING TYPE 12SA7GT

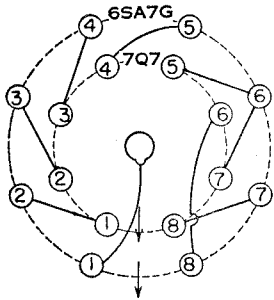


INNER CIRCLES REPRESENT THE PINS OF THE TYPE OF TUBE AVAILABLE FOR USE IN THE SOCKET WIRED FOR THE TYPE SHOWN AS THE OUTER CIRCLE. THE SOLID LINES SHOW THE WIRING FOR EITHER AN ADAPTOR OR FOR RECONNECTING TO THE SAME OR TO DIFFERENT SOCKETS.

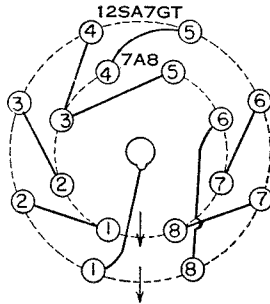
ADAPTOR CIRCUITS COMMONLY REQUIRED

CONVERTERS CONTD

TYPE 7Q7 REPLACING TYPE 6SA7GT
TYPE 14Q7 REPLACING TYPE 12SA7

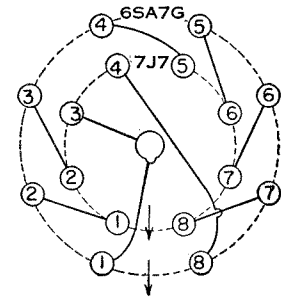


TYPE $\begin{cases} 7A8 \\ 14B8 \end{cases}$ REPLACING TYPE 12SA7GT
TYPE $\begin{cases} 7B8 \\ 7A8 \end{cases}$ REPLACING TYPE 6SA7GT



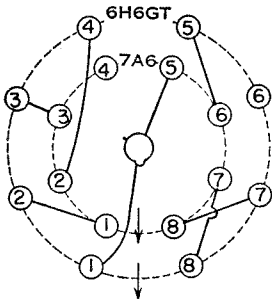
* REQUIRES 42 TO 50 OHMS ACROSS HEATERS IN AC-DC SETS.

TYPE $\begin{cases} 14S7 \\ 14J7 \end{cases}$ REPLACING TYPE 12SA7GT
TYPE $\begin{cases} 7S7 \\ 7J7 \end{cases}$ REPLACING TYPE 6SA7GT



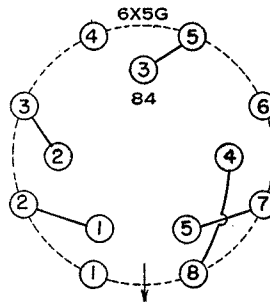
RECTIFIERS

TYPE 7A6 REPLACING TYPE 6H6GT

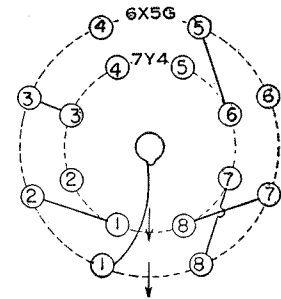


REQUIRES 42 TO 50 OHMS ACROSS HEATERS IN AC-DC SETS.

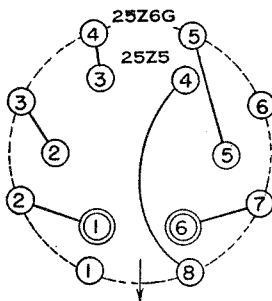
TYPE 84 REPLACING TYPE 6X5G



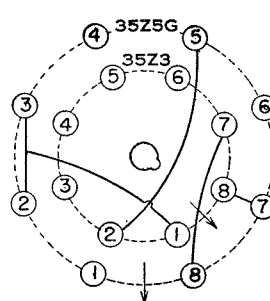
TYPE 7Y4 REPLACING TYPE 6X5G



TYPE 25Z5 REPLACING TYPE 25Z6G

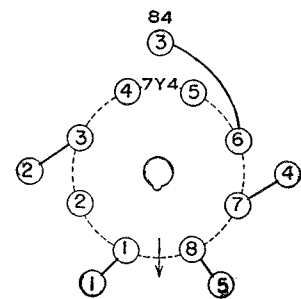


TYPE 35Z3 REPLACING TYPE 35Z5GT/G



OTHER PROVISION NECESSARY FOR PILOT LAMP.

TYPE 7Y4 REPLACING TYPE 84

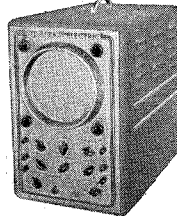


INNER CIRCLES REPRESENT THE PINS OF THE TYPE OF TUBE AVAILABLE FOR USE IN THE SOCKET WIRED FOR THE TYPE SHOWN AS THE OUTER CIRCLE. THE SOLID LINES SHOW THE WIRING FOR EITHER AN ADAPTOR OR FOR RECONNECTING TO THE SAME OR TO DIFFERENT SOCKETS.

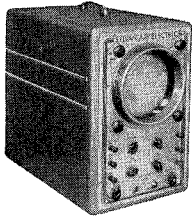
Look to SYLVANIA for the latest in ELECTRONIC TEST EQUIPMENT



Television Oscilloscope. An Exceptionally High-Gain, Wide-Band Oscilloscope Designed for Television. Accurately displays any TV pulse or wave-shape on a large, eye-saving 7" screen. Sensitivity: 0.01 v./in. Vert. response useful to 4.0 mc. Hard-tube sweeps to 50 kc.; phasing control; pos. or neg. sync. control; many other outstanding features. Recommended for servicemen; laboratories; advanced schools and industry.



Type 400

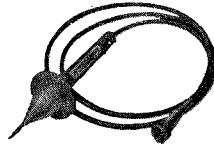


Type 132Z

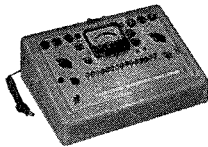
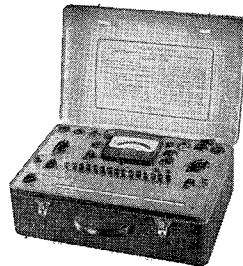
General Purpose Oscilloscope. A Versatile 7" Scope with Many Features Found in Type 400 above, priced as low as oscilloscopes with smaller screens. Sensitivity: 0.10 v./in.; freq. response: exceeds 7 cps. to 70 kc. Widely used by servicemen, schools and industry for AM-FM-TV testing.

TV High-Voltage Probes. New, Quality Probes that Permit Measuring High TV Anode Voltages by increasing the dc range of Polymeters to 30,000 or 10,000 volts. Special conversion cartridge permits using 30 kv probes with ANY 1,000 volt scale 20,000 ohm/volt meter. Select correct probe from list below:

Type	Range	Use with
225	30 kv	Polymer, Type 221 or 221Z.
224	30 kv	Earlier Polymeters, Types 134 and 134Z.
226	30 kv	Conversion cartridge for use with above Type 225 or 224 to convert ANY 20,000 ohm/volt meter with a 1000-volt scale to a kilovoltmeter
223	10 kv	Polymer, Type 221 or 221Z.
222	10 kv	Earlier Polymeters, Types 134 and 134Z.

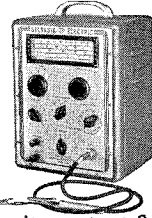


Tube Tester Type 220. Made By A Tube Manufacturer For Tube Users, these instruments test for ALL usual faults—not just one particular characteristic. New and exclusive ohmmeter-type shorts/leakage test indicates "GOOD" or "REPLACE" directly on the illuminated meter. Gas and a special heater-cathode leakage tests made in single operations. Single composite dynamic test for emission, transconductance and relative tube life. Panel-mounted roller-chart; convenient switches; provisions for future tubes. Portable Type 220 has durable metal case and handle; removable cover. Size: 6" x 11¼" x 17".



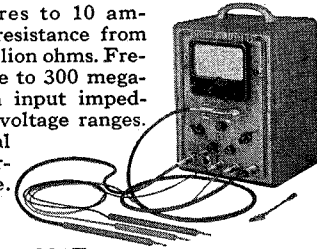
Tube Tester Type 219. The counter Type 219 is electrically equivalent to the portable type. Attractively housed in a streamlined wood and metal cabinet. Adaptable to any surroundings. Occupies small counter space. Size: 5⅞" x 13" x 18⅞".

TV Signal Generator. An ALL ELECTRONIC Sweep Generator for TV and FM. Fundamental center frequencies: 2-25, 20-64, 60-120, and 140-230 mc. Two adjustable sweep widths: 0-600 kc./15 mc.; excellent sweep linearity; output 0.1 v. Edge-lighted dial; simplified controls; small size: 11½" x 8½" x 7". May be used with any 'scope and marker including those shown at left and below.



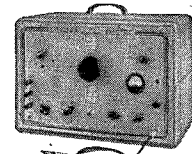
Type 500

Polymer-TV Vacuum-Tube Voltmeter. A Sensitive DC, AC and RF Vacuum-Tube Voltmeter, Ohmmeter and DC Current Meter. The basic instrument for every TV, FM and AM shop. Ranges: rf to 300 volts (only 3 μmf shunt capacity); ac and dc to 1000 volts (10 or 30 kv dc using h.v. probes described at left); dc current from 50 microamperes to 10 amperes; and resistance from 0.5 to one billion ohms. Frequency range to 300 megacycles. High input impedance on all voltage ranges. Size identical to TV generator above.



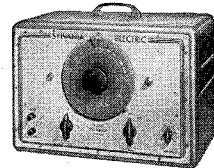
Type 221Z

FM-AM Signal Generator. Useful as a TV Marker. A versatile AM-FM generator, doubly useful for peaking alignment of TV and as a TV marker. Calibrated to 0.05%. Fundamentals 80 kc to 120 mc; harmonics to 240 mc. Modulation: 0-100% AM; 0-30/150/700 kc FM. 1.0 volt max. output. Low leakage. Built-in crystal circuit. Size same as audio oscillator below.



Type 216

Audio Oscillator. An Accurate Sine-Wave Generator for Better Equipped Shops and Sound Specialists. Maximum output: 22.5 volts, 20-20,000 cps, flat within 2 db. size 11⅜" x 17½" x 9⅞"



Type 145

SYLVANIA ELECTRIC

