

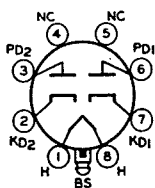
TYPE	Class	Use	E _r volts	I _r amps	E _b volts	E _{c2} volts	E _{c1} volts	I _b ma	I _{c2} ma	r _p MΩ	g _m μmhos	
45B5	5	Class A Amplifier	45	0.1	170 100	170 100	-12.5 -6.7	70 43	5.0 3.0	-0.23 -0.23	10,000 9000	R _L = 2.4 KΩ, 5.6 w R _L = 2.4 KΩ, 1.9 w
45Z3	2R	Half-wave Rectifier	45.0	0.075	Max. AC Plate Voltage = 117 volts Max. DC Output = 65 ma Max. PIV = 350 volts Max. Peak Plate Current = 390 ma							
45Z5GT	2R	Half-wave Rectifier	45.0	0.15	See 35Z5GT Characteristics							
46	4	Class A Amplifier ■	2.5	1.75	250	—	-33.0	22.0	—	0.0023	2350	R _L = 6.4 KΩ, W _o = 1.25 watts
		Class B Amplifier ▽			300 400	— —	0 0	8.0 12.0	—	—	R _L = 5.2 KΩ, W _o = 16.0 watts R _L = 5.8 KΩ, W _o = 20.0 watts	
47	5	Class A Amplifier	2.5	1.75	250	250	-16.5	31.0	6.0	0.06	2500	R _L = 7.0 KΩ, W _o = 2.7 KΩ
48	4	Tetrode Amplifier	30.0	0.4	96 125	96 100	-19.0 -20.0	52.0 56.0	9.0 9.5	—	3800 3900	R _L = 1.5 KΩ, W _o = 2.0 watts R _L = 1.5 KΩ, W _o = 2.5 watts
49	4	Class A Amplifier	2.0	0.12	135	—	-20.0	6.0	—	0.004	1125	R _L = 11.0 KΩ, μ = 4.7 W _o = 0.17 watts
50	3	Class A Amplifier	7.5	1.25	300	—	-54	35	—	0.002	1900	R _L = 4.6 KΩ, W _o = 1.6 watts μ = 3.8
					450	—	-84	55	—	0.0018	2100	R _L = 4.35 KΩ, W _o = 4.6 watts μ = 3.8
50A5	5	Class A Amplifier	50.0	0.15	See 50L6GT Characteristics							
50AX6GT	2R, 2R	Full-wave Rectifier	50.0	0.3	Max. PIV/Plate = 1250 volts Max. Output Current/Plate = 125 ma							
50B5	5	Class A Amplifier	50.0	0.15	See 50C5 Characteristics							
50BK5	5	Power Amplifier	50.0	0.15	250	250	-5.0	35	3.5	0.1	8500	R _L = 6.5 KΩ, W _o = 3.5 watts
					100	—	0	3.5	—	0.028	2500	μ = 70
50BM8	3, 5	Tri. Amplifier	50.0	0.10	200	200	-16.0	35	7.0	0.02	6400	R _L = 5.6 KΩ, W _o = 3.5 watts
		Pent. Amplifier			110	110	-7.5	49	4.0	0.01	7500	R _L = 2.5 KΩ, W _o = 1.9 watts
50C5	5	Power Amplifier	50.0	0.15	110	110	-7.5	49	4.0	0.01	7500	R _L = 2.5 KΩ, W _o = 1.9 watts
50C6G	5	Class A Amplifier	50.0	0.15	135	135	-13.5	58.0	3.5	0.0093	7000	R _L = 2.0 KΩ, W _o = 3.6 watts
50C6GA					200	135	-14.0	61.0	2.2	0.0183	7100	R _L = 2.6 KΩ, W _o = 6.0 watts
50CA5	5	Power Amplifier	50.0	0.15	See 6CA5 Characteristics							
50CD6G	5	Horiz. Amplifier	50.0	0.3	Max. Peak Pos. Pulse Plate = 6000 volts Max. Screen Voltage = 175 volts Max. Output Current = 200 ma Plate Dissip. = 15 w							
50DC4	2R	Half-wave Rectifier	50.0	0.15	Max. AC Voltage/Plate = 117 volts (rms) Max. Peak Plate Current = 720 ma Max. DC Output Current = 110 ma Max. PIV = 330 volts							
50EH5	5	Class A Amplifier	50.0	0.15	See 6EH5 Characteristics							
50L6GT	5	Class A Amplifier	50.0	0.15	100	110	-7.5	49.0	4.0	0.013	8000	R _L = 2 KΩ, 2.1 w
					200	125	*	46.0	2.2	0.028	8000	R _L = 4 KΩ, 3.8 w

*See quoted value of R_k ▽ Two valves ■ G₁ tied to plate ▽ G₁ and G₂ tied together

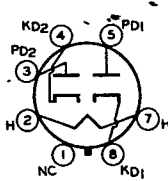
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50X6	2R, 2R	Rectifier	50.0	0.15	Max. PIV = 700 volts Max. Peak Plate Current/Plate = 450 ma Max. DC Output Current/Plate = 75 ma							
50Y6GT	2R, 2R	Rect. Doubler	50.0	0.15	See 25Z6 Characteristics							
50Y7GT	2R, 2R	Rectifier	50.0	0.15	Max. PIV = 700 volts Max. Peak Plate Current/Plate = 450 ma Max. DC Output Current/Plate = 75 ma							
50Z6G	2R, 2R	Full-wave Rectifier	50.0	0.3	Max. AC Voltage/Plate = 250 volts (rms) Max. DC Output Current = 250 ma							
50Z7G	2R, 2R	Voltage Doubler	50.0	0.15	Max. AC Voltage/Plate = 117 volts (rms) Max. DC Output Current = 65 ma							
		Half-wave Rectifier			Max. AC Voltage/Plate = 117 volts (rms) Max. DC Output Current = 65 ma							
53	3, 3	Amplifier	2.5	2.0	See 6N7GT Characteristics							
55	2, 2, 3	Amplifier	2.5	1.0	See Type 85 Characteristics							
55N3	2R	Half-wave Rectifier	55.0	0.1	Max. AC Voltage/Plate = 250 volts Max. Output Current = 180 ma							
56	3	Amplifier	2.5	1.0	See Type 76 Characteristics							
57	5	Amplifier Detector	2.5	1.0	See 6J7 Characteristics							
58	5	Amplifier Mixer	2.5	1.0	See 6U7G Characteristics							
59	5	Pent. Amplifier	2.5	2.0	250	250	-18.0	35.0	9.0	0.055	2500	$R_L = 6.0 K\Omega$, $W_o = 3.0$ watts
70L7GT	2, 5	Class A Amplifier	70.0	0.15	110	110	-7.5	40.0	3.0	0.015	7500	$R_L = 2.0 K\Omega$, $W_o = 1.8$ watts
		Half-wave Rectifier			Max. DC Output Curr. = 70 ma Max. Peak Plate Curr. = 420 ma Max. PIV = 350 volts							
71	3	Class A Amplifier	5.0	0.25	180	—	-40.5	20	—	—	1700	$R_L = 4.8 K\Omega$, $W_o = 0.79$ watts
71A	3	Class A Amplifier	5.0	0.25	90	—	-16.5	10.0	—	0.002	1400	$R_L = 3.0 K\Omega$, $W_o = 0.125$ watts
					180	—	-40.5	29.0	—	0.002	1700	$R_L = 4.8 K\Omega$, $W_o = 0.79$
71B	3	Class A Amplifier	5.0	0.125	See 71A Characteristics							
75	2, 2, 3	Class A Amplifier	6.3	0.3	See 6SQ7 Characteristics							
76	3	Class A Amplifier	6.3	0.3	250	—	-13.5	5.0	—	0.0395	1450	$\mu = 13.8$
77	5	Class A Amplifier	6.3	0.3	250	100	-3.0	2.3	0.5	1.0	1250	
78	5	Amplifier Mixer	6.3	0.3	See 6K7 Characteristics							
79	3, 3	Power Amplifier	6.3	0.6	250	—	0	5.3 ϕ	—	—		$R_L = 14.0 K\Omega$, $W_o = 8.0$ watts ▼
80	2R, 2R	FW Rectifier	5.0	2.0	See 5Y3GT Characteristics							
81	2R	Half-wave Rectifier	7.5	1.25	Max. AC Plate Voltage = 700 volts (rms) Max. PIV = 2000 volts Max. DC Output Curr. = 85 ma Max. DC Output Current = 85 ma Max. Peak Plate Curr. = 500 ma							

 ϕ Per Plate

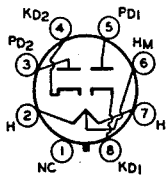
▼Two valves



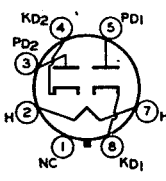
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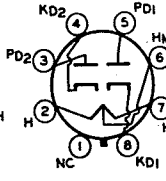
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50Y6-GT



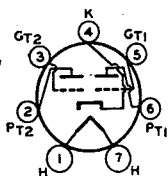
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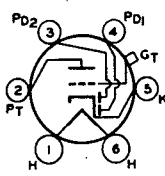
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50Z7-G



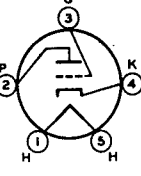
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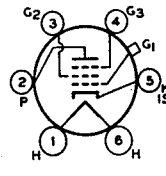
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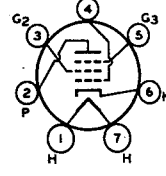
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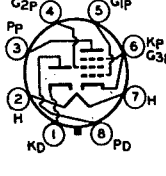
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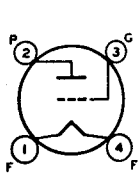
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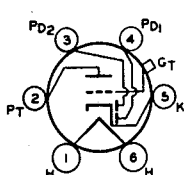
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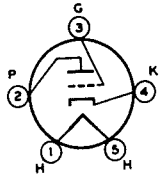
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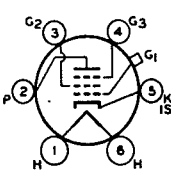
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71-B



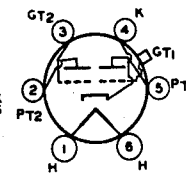
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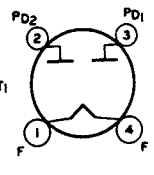
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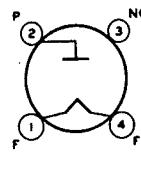
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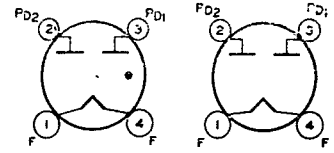
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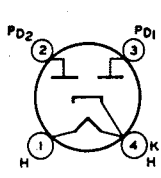
TYPE	Class	Use	E_f volts	I_f amps	E_b volts	E_{c2} volts	E_{c1} volts	I_b ma	I_{c2} ma	r_p M Ω	g_m μ mhos	
82	2R, 2R	Full-wave Rectifier	2.5	3.0	Max. DC Output Current = 115 ma Max. Peak Plate Current/Plate = 600 ma Max. PIV = 1550 volts							
83	2R, 2R	Full-wave Rectifier	5.0	3.0	Max. Peak Plate Current/Plate = 1000 ma Max. PIV = 1550 volts Max. Output Current = 225 ma							
83V	2R, 2R	FW Rectifier	5.0	3.0	See 5V4G Characteristics							
84/6Z4	2R, 2R	Full-wave Rectifier	6.3	0.5	Max. DC Output Current = 60 ma Max. PIV = 1250 volts Max. Peak Plate Curr./Plate = 180 ma							
85	2, 2, 3	Class A Amplifier	6.3	0.3	135 250	—	-10.5 -20.0	3.7 8.0	—	0.011 0.007	750 1100	$R_L = 25 K\Omega$, $W_o = 0.075$ watts $R_L = 20 K\Omega$, $W_o = 0.35$ watts
89	5	Class A Amplifier	6.3	0.4	250	250	-25.0	32	5.5	0.07	1800	$R_L = 6.75 K\Omega$, $W_o = 3.4$ watts
117L7/ M7GT	2R, 5	Class A Amplifier	117	0.09	105	105	-5.2	43	4.0	0.017	5300	$R_L = 4.0 K\Omega$, $W_o = 0.85$ watts
		Half-wave Rectifier			Max. AC Plate Voltage = 117 volts (rms) Max. DC Output Curr. = 75 ma Max. PIV = 350 volts Max. Peak Plate Curr. = 450 ma							
117N7GT	2R, 5	Class A Amplifier	117	0.09	100	100	-6.0	51.0	5.0	0.016	7000	$R_L = 3.0 K\Omega$, $W_o = 1.2$ watts
		Half-wave Rectifier			Max. AC Plate Voltage = 117 volts (rms) Max. DC Output Curr. = 75 ma Max. Peak Plate Curr. = 450 ma Max. PIV = 350 volts							
117P7GT	2R, 5	Amplifier, HW Rectifier	117	0.09	See 117L7/M7GT							
117Z3	2R	Half-wave Rectifier	117	0.04	Max. AC Plate Voltage = 117 volts (rms) Max. DC Output Curr. = 90 ma Max. PIV = 330 volts Max. Peak Plate Curr. = 540 ma							
117Z4GT	2R	Half-wave Rectifier	117	0.04	Max. AC Plate Voltage = 117 volts (rms) Max. DC Output Current = 90 ma Max. PIV = 350 volts Max. Peak Plate Current = 540 ma							
117Z6G	2R, 2R	Voltage Doubler	117	0.075	Max. AC Voltage/Plate = 117 volts (rms) Max. DC Output = 60 ma							
117Z6GT		Half-wave Rectifier			Max. AC Voltage/Plate = 235 volts (rms) Max. DC Output Curr./Plate = 60 ma							
5881	5	Power Amplifier	6.3	0.9	See 6L6G Characteristics							
6973	5	Class A Amplifier	6.3	0.45	250	250	-15	46	3.5	0.073	4800	$R_L = 7.5 K\Omega$, $W_o = 20$ watts
		P.P. AB ₁ Amp.			350	280	-22	58	3.5	—	—	
7025	2, 3	AF Amplifier	12.6 6.3	0.15 0.3	See 12AX7 Characteristics							
7027	5	P.P. AB ₁ Amp.	6.3	0.9	330	330	-24	122	5.6	—	—	$R_L = 4.5 K\Omega$, $W_o = 31.5$ watts
7199	3, 5	AF Tri. Amp.	6.3	0.45	215	—	-8.5	9.0	—	0.008	2100	$\mu = 17$
		AF Pent. Amp.			100	50	*	1.1	0.35	1.0	1500	$R_k = 1.0 K\Omega$

*See quoted value of R_k

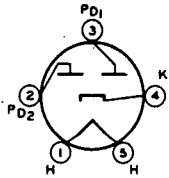


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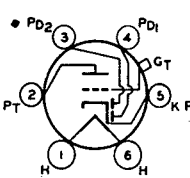
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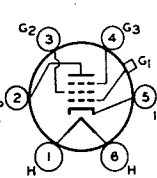
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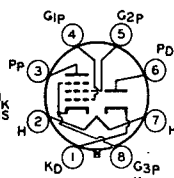
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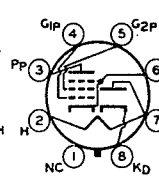
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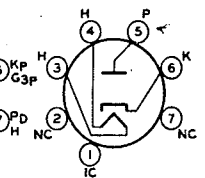
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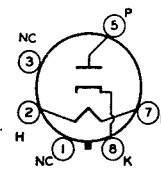
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117L7-GT/
117M7-GT
117M7-GT



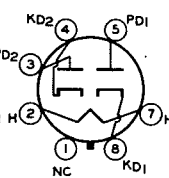
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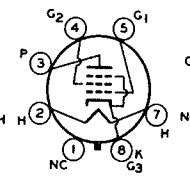
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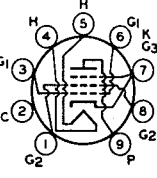
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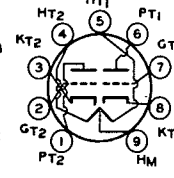
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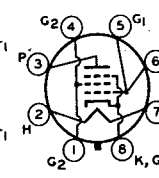
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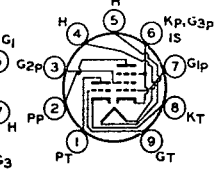
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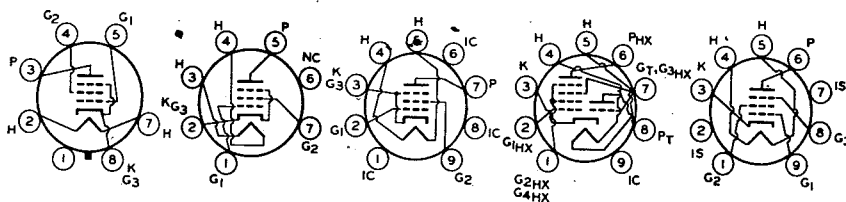


7027



7199

TYPE	Class	Use	E_f volts	I_f amps	E_b volts	E_{c2} volts	E_{c1} volts	I_b ma	I_{c2} ma	r_p M Ω	g_m μ mhos	
KT61	5	Power Amplifier	6.3	0.95	250	250	-4.4	40	4.3	0.07	9800	$R_L = 6.0 K\Omega$ $W_o = 4.3$ watts $R_k = 90 \Omega$
KT66	5	Power Amplifier	6.3	1.27	250	250	-15	85	6.3	0.022	6300	$R_L = 2.2 K\Omega$ $W_o = 7.25$ watts $R_k = 160 \Omega$
KT88	5	Class A Amplifier	6.3	1.6	250	250	—	140	—	0.012	11,000	
		Class AB ₂ Amplifier			600	350	-45	100	6.0	—	—	
N78	5	Power Amplifier	6.3	0.64	See 6BJ5 Characteristics							
N709	5	Power Amplifier	6.3	0.76	See 6BQ5 Characteristics							
X79	3, 6	Converter	6.3	0.3	See 6AE8 Characteristics							
Z729	5	Low-noise AF Amplifier	6.3	0.3	See 6BK8 Characteristics							



KT66
KT66
KT88

N78

N709

X79

Z729

VALVE EQUIVALENTS

Type	Equivalent	Type	Equivalent	Type	Equivalent
1C1	1R5	DAF91	1S5	EC94	6AF4
1C2	1AC6	DAF92	1U5	EC95	6ER5
1D13	1A3	DAF96	1AH5	ECC81	12AT7
1F2	1L4	DC80	1E3	ECC82	12AU7
1F3	1T4	DCC90	3A5	ECC83	12AX7
1FD1	1AH5	DF33	1N5GT	ECC85	6AQ8
1FD9	1S5	DF91	1T4	ECC88	6DJ8
1P1	3C4	DF92	1L4	ECC91	6J6
1P10	3S4	DF96	1AJ4	ECC180	6BQ7A
1P11	3V4	DF904	1U4	ECC189	6ES8
6D2	6AL5	DH63(M)	6Q7/G/GT	ECF80	6BL8
6F12	6AM6	DH77	6AT6	ECF82	6U8
6L12	6AQ8	DH149	7C6	ECH80	6AN7
6L34	6AQ4	DH150	6CV7	ECH81	6AJ8
6LD3	6CV7	DH719	6AK8	ECL80	6AB8
6P9	6BM5	DH719	6T8A	ECL82	6BM8
6P15	6BQ5	DK32	1A7GT	ED2	6AL5
7D9	6AM5	DK91	1R5	EF41	6CJ5
7D10	6CH6	DK92	1AC6	EF80	6BX6
8D3	6AM6	DK96	1AB6	EF85	6BY7
8D5	6BR7	DL29	3D6	EF89	6DA6
8D7	6BS7	DL33	3Q5GT	EF89F	6DG7
9D6	6CQ6	DL35	1C5GT	EF91	6AM6
9P9	9BM5	DL36	1Q5GT	EF92	6CQ6
13D2	6SN7GT	DL91	1S4	EF93	6BA6
17N8	17C8	DL92	3S4	EF94	6AU6
19U3	19X3	DL93	3A4	EF95	6AK5
62DDT	6CV7	DL94	3V4	EF96	6AG5
62VP	6CJ5	DL95	3Q4	EF183	6EH7
63T1	6AB8	DL96	3C4	EF184	6EJ7
64SPT	6BX6	DL98	3B4	EH90	6CS6
65ME	6BR5	DP61	6AK5	EK90	6BE6
66KU	6BT4	EAA91	6AL5	EL81	6CJ6
67PT	6CK5	EABC80	6T8	EL83	6CK6
141TH	14K7	EABC80	6AK8	EL84	6BQ5
311SU	31A3	EA42	6CT7	EL85	6BN5
451PT	45A5	EB91	6AL5	EL86	6CW5
B36	12SN7GT	EBC41	6CV7	EL90	6AQ5
B65	6SN7GT	EBC80	6BD7	EL91	6AM5
B152	12AT7	EBC90	6AT6	EL180	12BY7A
B309	12AT7	EBC91	6AV6	FL821	6CH6
B329	12AU7	EBF80	6N8	EQ80	6BE7
B339	12AX7	EBF81	6AD8	EY51	6X2
BF61	6CK5	EBF89	6DC8	EY80	6U3
BPMO4	6AQ5	EC80	6Q4	EY81	6R3
D2M9	6AL5	EC81	6R4	EY82	6N3
D77	6AL5	EC84	6AJ4	EZ35	6X5GT
D152	6AL5	EC90	6C4	FZ40	6BT4
DA90	1A3	EC91	6AQ4	FZ80	6V4
DAC32	1H5GT	EC92	6AB4	EZ81	6CA4

Type	Equivalent	Type	Equivalent	Type	Equivalent
EZ90	6X4	N309	15A6	UF41	12AC5
EZ91	6AV4	N359	21A6	UL41	45A5
GZ30	5Z4	N709	6BQ5	UL84	45B5
GZ32	5V4GA	N727	6AQ5	UY41	31A3
GZ34	5AR4	PABC80	9AK8	UY85	38A3
H63	6F5/GT	PCC85	9AQ8	V2M70	6X4
HAA91	12AL5	PCF80	9A8	V61	6BT4
HABC80	19T8	PCF82	9U8A	VP6	6CQ6
HBC90	12AT6	PL36	25E5	W17	1T4
HBC91	12AV6	PL81	21A6	W149	7B7
HD14	1H5GT	PL83	15A6	W727	6BA6
HD30	3B4	PM04	6BA6	WD142	12S7
HF93	12BA6	PM07	6AM6	WD709	6N8
HF94	12AU6	PY80	19X3	X14	1A7GT
HK90	12BE6	PY81	17Z3	X17	1R5
HL90	19AQ5	PY82	19Y3	X18	1AC6
HL92	50C5	R52	5Z4	X20	1AC6
HL94	30A5	SP6	6AM6	X79	6AE8
HM04	6BE6	U43	6X2	X148	7S7
HY90	35W4	U50	5Y3GT	X719	6AJ8
KT63	6F6G	U52	5U4G	X727	6BE6
L63	6J5/GT	U78	6X4	XCC189	4ES8
L77	6C4	U145	31A3	XL84	8BQ5
LN152	6AB8	U147	6X5GT	Z14	1N5GT
N14	1C5GT	U149	7Y4	Z63	6J7/GT
N16	3Q5GT	U150	6BT4	Z77	6AM6
N17	3S4	U151	6X2	Z152	6BX6
N18	3Q4	U153	17Z3	Z719	6BX6
N19	3V4	U154	19Y3	ZD17	1S5
N78	6BJ5	UAF42	12S7	ZD152	6N8
N142	45A5	UBC41	14L7		
N144	6AM5	UBF80	17C8		
N150	6CK5	UCH42	14K7		
N152	21A6	UCH81	19D8		
N153	15A6	UCL82	50BM8		

PICTURE TUBE DATA

For picture tube interchangeability

data, see page 104.

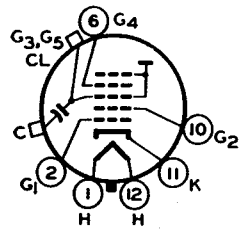
PICTURE TUBE DATA

TYPE	Diagonal Deflection Angle	External Conductive Coating pf	MAXIMUM RATINGS				TYPICAL GRID-DRIVE SERVICE				Minimum PM Ion-trap Magnet Oersted
			Ultor* volts	Focus Electrode volts	Grid No. 2 volts	Grid No. 1 volts §	Ultor* volts	Grid No. 2 volts	Focus Electrode volts	Grid No. 1 volts	
17AVP4A	90°	1200 to 1500	16,000	+1000 to -500†	500	-125	14,000	300	-55 to +310	-28 to -72	31
							16,000	300	-65 to +350	-28 to -72	33
17BJP4	90°	1200 to 1500	16,000	+1000 to -500†	500	-140	12,000	300	-50 to +265	-28 to -72	—
							14,000	300	-55 to +300	-28 to -72	—
17BZP4	110°	800 to 1500	16,000	+1000 to -500†	500	-140	14,000	300	Zero to +400	-28 to -72	—
							16,000	400	Zero to +400	-36 to -94	—
17CGP4	70°	750 to 1500	16,000	+1000 to -500†	500	-125	1,400	300	-55 to -300	-28 to -72	—
							16,000	300	-65 to +350	-28 to +72	—
17HP4B	70°	750 to 1500	16,000	+1000 to -500†	500	-125	14,000	300	-55 to +300	-28 to -72	31
							16,000	300	-65 to +350	-28 to -72	33
19AKP4	114°	1000 to 1500	20,000	—	550	-154	16,000	300	—	-35 to -72	—
19XP4	114°	1000 to 1500	20,000	+1100 to -550	550	-154	16,000	400	Zero to +400	-36 to -94	—
21ALP4A	90°	500 to 750	18,000	+1000 to -500†	500	-125	16,000	300	-65 to +350	-28 to -72	33
							18,000	400	-75 to +400	-37 to -96	35
21BCP4	90°	2000 to 2500	20,000	+1000 to -500	500	-140	16,000	300	Zero to +450	-28 to -72	—
21CBP4A	90°	2200 to 2900	18,000	+1000 to -500†	500	-140	14,000	300	-55 to +300	-28 to -72	—
							18,000	300	-70 to +396	-28 to -72	—
21CEP4	110°	2000 to 2500	18,000	+1000 to -500†	500	-140	14,000	300	Zero to +400	-28 to -72	—
							16,000	400	Zero to +400	-36 to -94	—
21DAP4	110°	2000 to 2500	18,000	+1000 to -500	500	-154	16,000	400	Zero to +400	-36 to -78	—
23AVP4	110°	2000 to 2500	20,000	+1100 to -550	500	-154	18,000	400	Zero to +400	-42 to -78	—
23CP4/ 23HP4	114°	2000 to 2500	22,000	+1100 to -550	550	-154	18,000	400	Zero to +400	-44 to -94	—
23MP4	114°	1700 to 2000	22,000	+1100 to -550	550	-154	18,000	400	Zero to +400	-36 to -94	—

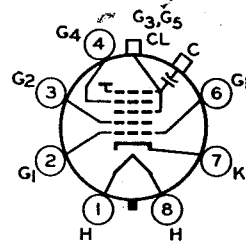
*The Ultor is the electrode to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection. (G₂, G₅, and CL).

†This value has been specified to take care of the condition where an ac voltage is provided for dynamic focusing.

§Positive bias value = 0 volts; peak positive value = 2 volts.



ULTOR = $G_3 + G_5 + CL$
 FOCUSING ELECTRODE = G_4



ULTOR = $G_3 + G_5 + CL$
 FOCUSING ELECTRODE = G_4

17AVP4A

17BJP4

17CGP4

17HP4B

21ALP4A

21BCP4

21CBP4A

17BZP4

19AKP4

19XP4

21CEP4

21DAP4

23AVP4

23CP4/23HP4

23MP4

PICTURE TUBE

TYPE	Replace with	Focus	Heater	Defl. Angle	Ion-Trap Magnet (gausses)	MAXIMUM DIMENSIONS—INCHES				
						Overall Length	Envelope Diagonal	Width	Height	Neck Length
5-3T	17HP4B ⁽⁷⁾	ES	8-0V, 0-3A	70°	None	—	—	—	—	—
14ASP4	None	ES	6-3V, 0-6A	110°	None	11-5/8	14	13-5/16	11	6-1/16
14RP4†	None	ES	6-3V, 0-6A	90°	35	13-1/2	14-1/8	13-3/16	10-11/16	5-11/16
14RP4A	None	ES	6-3V, 0-6A	90°	Same as 14RP4 except for Aluminized Screen.					
14WP4	None	ES	6-3V, 0-6A	90°	None	13-9/16	14-1/8	13-3/16	10-11/16	5-11/16
17ATP4/ 17AVP4†	17BJP4 ⁽⁸⁾	ES	6-3V, 0-6A	90°	31-33	16	16-3/4	15-33/64	12-13/32	6-11/16
17ATP4A/ 17AVP4A	17BJP4 ⁽⁸⁾	ES	6-3V, 0-6A	90°	Same as 17ATP4/17AVP4 except for Aluminized Screen.					
17BJP4	17BJP4	ES	6-3V, 0-6A	90°	None	15	16-3/4	15-1/2	12-13/32	5-11/16
17BP4B	17CGP4 ⁽²⁾	M	6-3V, 0-6A	70°	35	19-9/16	16-3/4	15-33/64	12-13/32	7-11/16
17BZP4	17BZP4	ES	6-3V, 0-6A	110°	None	12-13/16	16-11/16	15-3/4	12-7/8	5-9/16
17CGP4	17CGP4	ES	6-3V, 0-6A	70°	None	17-5/8	16-5/8	15-1/2	12-3/8	5-11/16
17HP4‡	17CGP4 ⁽⁸⁾	ES	6-3V, 0-6A	70°	31-33	19-5/8	16-5/8	15-1/2	12-3/8	7-1/2
17HP4B	17CGP4 ⁽⁸⁾	ES	6-3V, 0-6A	70°	Same as 17HP4 except for Aluminized Screen.					
17RP4‡	17CGP4 ⁽⁸⁾	ES	6-3V, 0-6A	70°	45	19-5/8	16-3/4	15-1/2	12-3/8	7-11/16
19AKP4	19AKP4	ES	6-3V, 0-6A	114°	None	12-5/8	18-3/4	16-17/32	13-1/2	5-1/4
19XP4	19XP4	ES	6-3V, 0-6A	114°	None	11-5/8	18-3/4	16-17/32	13-15/32	4-1/4
21ALP4‡	21CBP4A ⁽⁸⁾	ES	6-3V, 0-6A	90°	33-35	20-3/8	21-1/2	20-3/8	16-1/2	7-7/16
21ALP4A/ 21ALP4B	21CBP4A ⁽⁸⁾	ES	6-3V, 0-6A	90°	Same as 21ALP4 except for Aluminized Screen.					
21ATP4	21CBP4A ⁽⁸⁾	ES	6-3V, 0-6A	90°	35	20-3/8	21-9/16	20-7/16	16-9/16	7-11/16
21BCP4	None	ES	6-3V, 0-6A	70°	None	23-13/32	21-11/32	20-3/8	15-11/16	7-11/16
21CBP4A	21CBP4A	ES	6-3V, 0-6A	90°	None	18-3/8	21-1/2	20-3/8	16-1/2	5-7/16
21CEP4	21CEP4	ES	6-3V, 0-6A	110°	None	14-3/4	21-1/2	20-3/8	16-1/2	5-9/16
21DAP4	21DAP4	ES	6-3V, 0-6A	110°	None	15	21-1/2	20-3/8	16-1/2	5-9/16
21ZP4B/300	None	M	6-3V, 0-3A	70°	40	23-13/32	21-11/32	20-3/8	15-11/16	7-11/16
23AVP4*†	23AVP4	ES	6-3V, 0-6A	110°	None	15-9/16	24-51/64	21-7/16	17-7/16	5-1/4
23CP4*	23CP4/23HP4	ES	6-3V, 0-6A	110°	None	15-9/16	24-51/64	21-7/16	17-7/16	5-1/4
23CP4/ 23HP4*	23CP4/23HP4	ES	6-3V, 0-6A	110°	Replacement for 23CP4 and 23HP4.					
23HP4*	23CP4/23HP4	ES	6-3V, 0-6A	110°	None	15-7/8	24-51/64	21-7/16	17-7/16	5-9/16
23MP4	23MP4	ES	6-3V, 0-6A	114°	None	14-11/16	23-31/64	20-9/16	16-5/8	5-1/4
23QP4*	23CP4/23HP4	ES	6-3V, 0-6A	110°	None	15-9/16	24-51/64	21-7/16	17-7/16	5-1/4
23WP4	23MP4	ES	6-3V, 0-6A	114°	None	14-15/16	23-25/64	20-1/2	16-1/2	5-9/16

*Bonded faceplate.

†Antiglare faceplate.

‡Non-aluminized screen

INTERCHANGEABILITY

MAXIMUM RATINGS			TYPICAL OPERATION				BASE	TYPE
Ultor Voltage (volts)	Grid No. 2 Voltage (volts)	H-K Voltage (volts)	Ultor Voltage (volts)	Grid No. 2 Voltage (volts)	Focus Range (volts)	Grid No. 1 Ext. Range		
17,000	600	200	14,000	450	+800	-33 -77	F 5-3T	
14,000	500	±180	12,000	300	-50 +350	-28 -72	C 14ASP4	
14,000	500	±180	10,000	300	-50 +350	-28 -72	B 14RP4†	
14RP4A								
14,000	500	±180	12,000	300	-50 +350	-24 -72	B 14WP4	
16,000	500	±180	14,000 16,000	300 300	-65 +350 -55 +310	-28 -72 -28 -72	B 17ATP4/ 17AVP4†	
17ATP4A/ 17AVP4A								
16,000	500	±180	16,000	300	-55 +360	-28 -72	B 17BJP4	
16,000	410	±150	14,000	300	—	-33 -77	A 17BP4B	
16,000	500	±180	14,000 16,000	300 400	0-400 0-400	-28 -72 -36 -94	C 17BZP4	
16,000	500	±180	14,000	300	-50 +350	-28 -72	C 17CGP4	
16,000	500	±180	14,000 16,000	300 300	-55 +310 -65 +350	-28 -72 -28 -72	B 17HP4†	
17HP4B								
16,000	500	±180	14,000	300	-55 +300	-33 -77	B 17RP4†	
20,000 ⁽¹⁰⁾	550 ⁽¹⁰⁾	±200 ⁽¹⁰⁾	16,000	300	0-400	-35 -72	C 19AKP4	
20,000	550	±200	16,000	400	0-400	-36 -94	C 19XP4	
18,000	500	±180	16,000 18,000	300 400	-65 +350 -75 +400	-28 -72 -37 -96	B 21ALP4†	
21ALP4A/ 21ALP4B								
18,000	500	±180	16,000	300	-64 +350	-28 -72	H 21ATP4	
18,000	500	±180	16,000	300	-50 +350	-28 -72	B 21BCP4	
20,000	500	±180	16,000	300	0-450	-28 -72	B 21CBP4A	
18,000	500	±180	14,000 16,000	300 400	0-400 0-400	-28 -72 -36 -94	C 21CEP4	
18,000	500	±180	16,000	400	0-400	-36 -94	C 21DAP4	
18,000	500	±180	16,000	300	—	-33 -77	A 21ZP4B/300	
20,000	500	±180	18,000	400	0-400	-42 -78	C 23AVP4*†	
20,000	500	±180	18,000	400	0-400	-42 -94	C 23CP4*	
23CP4/ 23HP4*								
20,000	500	±180	16,000	300	0-400	-35 -72	C 23HP4*	
22,000 ⁽¹⁰⁾	550 ⁽¹⁰⁾	±200 ⁽¹⁰⁾	18,000	400	0-400	-36 -94	C 23MP4	
18,000	500	±180	18,000	400	0-400	-44 -94	G 23QP4*	
20,000 ⁽¹⁰⁾	550 ⁽¹⁰⁾	±200 ⁽¹⁰⁾	16,000	300	0-400	-35 -72	C 23WP4	

PICTURE TUBE

TYPE	Replace with	Focus	Heater	Defl. Angle	Ion Trap Magnet (gausses)	MAXIMUM DIMENSIONS—INCHES				
						Overall Length	Envelope Diagonal	Width	Height	Neck Length
24AEP4	None	ES	6-3V, 0-6A	90°	None	19-1/2	24-1/8	22-11/16	18-9/16	5-11/16
24AHP4	None	ES	6-3V, 0-6A	110°	None	15-13/16	24-1/8	22-13/16	18-9/16	5-9/16
24APL4	None	ES	6-3V, 0-6A	110°	None	16-3/16	24-1/8	22-13/16	18-5/8	5-5/8
24DP4A	None	ES	6-3V, 0-6A	90°	40	21-1/2	24	22-11/16	18-9/16	7-11/16
27SP4	None	ES	6-3V, 0-6A	90°	40	23-7/16	26-13/16	25-15/16	20-13/32	7-11/16
A43-64	17CGP4 ⁽⁸⁾	M	6-3V, 0-3A	70°	Same as MW43-64					
AME2350PB*	None	ES	12-6V, 0-3A	110°	None	15-9/16	24-51/64	21-7/16	17-7/16	5-1/4
AW43-20	17CGP4 ⁽⁹⁾	ES	6-3V, 0-3A	70°	None	18-9/16	16-3/4	15-1/2	12-3/8	6-7/16
AW43-80	17BJP4 ^{(8) (9)}	ES	6-3V, 0-3A	90°	50	15-5/8	16-3/4	15-1/2	12-3/8	6-1/2
AW43-88	17BZP4 ⁽⁹⁾	ES	6-3V, 0-3A	110°	None	12-13/16	16-11/16	15-3/4	12-7/8	5-9/16
AW47-30	19AKP4 ⁽⁹⁾	ES	6-3V, 0-3A	114°	None	12-15/16	18-5/8	16-13/32	13-11/32	5-9/16
AW53-80	21CBP4A ⁽⁹⁾	ES	6-3V, 0-3A	90°	50	19-3/8	21-1/2	20-3/8	16-1/2	6-5/16
AW53-88	21DAP4 ⁽⁹⁾	ES	6-3V, 0-3A	110°	None	15	21-1/2	20-3/8	16-1/2	5-7/16
AW59-30	23MP4 ⁽⁹⁾	ES	6-3V, 0-3A	110°	None	15	23-31/64	20-9/16	16-5/8	5-9/16
AW59-90	23MP4 ⁽⁹⁾	ES	6-3V, 0-3A	110°	None	15-1/2	23-35/64	20-5/8	16-5/8	5-9/16
CME2102	21DAP4 ⁽⁹⁾	ES	6-3V, 0-3A	110°	None	15	21-1/2	20-3/8	16-1/2	5-7/16
CRM171	None	M	12-6V, 0-3A	70°	50	19-11/16	16-3/4	15-1/2	12-3/8	7-9/16
CRM172	None	M	12-6V, 0-3A	70°	50	19-3/4	16-3/4	15-1/2	12-3/8	7-9/16
CRM211	None	M	12-6V, 0-3A	70°	50	23-1/2	21-3/8	20-3/8	15-5/8	7-9/16
CRM212	None	M	12-6V, 0-3A	90°	50	20-1/2	21-1/2	20-3/8	16-1/2	7-9/16
MW43-64†	17CGP4 ^{(8) (9)}	M	6-3V, 0-3A	70°	50	19-1/2	16-3/4	15-1/2	12-3/8	7-3/8
MW43-69	17CGP4 ^{(8) (9)}	M	6-3V, 0-3A	70°	Same as MW43-64 except for Aluminized Screen.					
MW43-80	17BJP4 ⁽⁹⁾	M	6-3V, 0-3A	90°	50	16-7/8	16-3/4	15-1/2	12-3/8	7-3/8
MW53-20	None	M	6-3V, 0-3A	70°	50	23-5/16	21-3/8	20-3/8	15-11/16	7-3/8
MW53-80	21CBP4A ⁽⁹⁾	M	6-3V, 0-3A	90°	50	20-1/4	21-1/2	20-3/8	16-1/2	7-3/8

*Bonded faceplate.

†Antiglare faceplate.

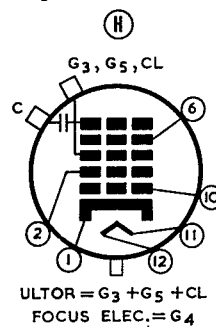
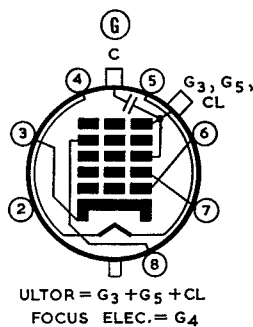
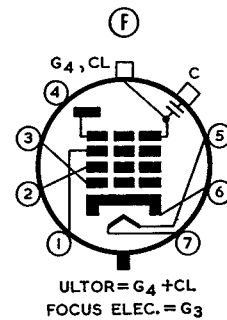
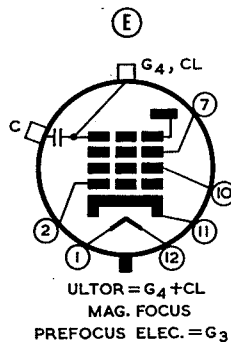
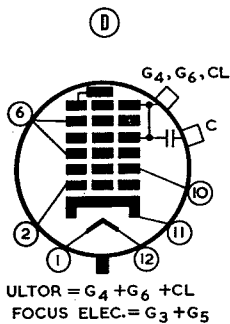
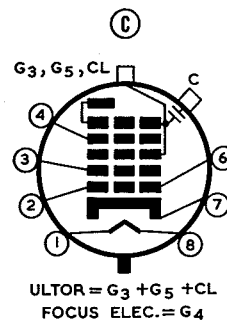
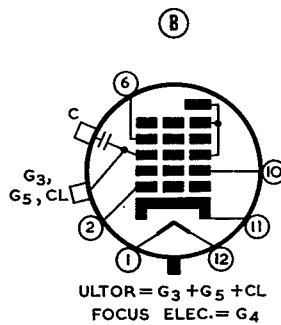
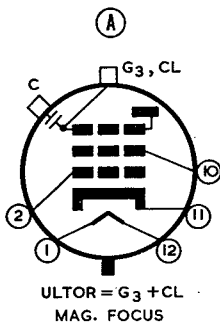
‡Non-aluminized screen

INTERCHANGEABILITY

	MAXIMUM RATINGS			TYPICAL OPERATION				BASE	TYPE
	Ultor Voltage (volts)	Grid No. 2 Voltage (volts)	H-K Voltage (volts)	Ultor Voltage (volts)	Grid No. 2 Voltage (volts)	Focus Range (volts)	Grid No. 1 Ext. Range		
	20,000	500	±180	18,000	300	-50 +350	-28 -72	B	24AEP4
	20,000	500	±180	16,000	300	-50 +350	-28 -72	C	24AHP4
	20,000	500	±180	17,000	300	0-500	-28 -72	C	24ALP4
	20,000	500	±180	18,000	300	-72 +400	-33 -77	B	24DP4A
	20,000	500	±180	18,000	300	-72 +396	-28 -72	B	27SP4
									A43-64
	16,000	400	±180	14,000 16,000	300	+100	-30 -72	C	AME2350PB*
	16,000	460	+180 -125	14,000	300 400	0-400 0-400	-33 -77 -44 -103	B	AW43-20
	18,000	500	+200 -125	14,000 16,000	300 300	-103 +203 -75 +235	-40 -80 -40 -80	D	AW43-80
	16,000	500	+200 -125	14,000 16,000	300 400	0-400 0-400	-30 -72 -38 -94	C	AW43-88
	16,000	500	+200 -125	14,000 16,000	300 400	0-400 0-400	-30 -72 -38 -94	C	AW47-30
	18,000	500	+200 -125	14,000 16,000	300 300	-103 +203 -75 +235	-40 -80 -40 -80	D	AW53-80
	16,000	500	+200 -125	14,000 16,000	300 400	0-400 0-400	-30 -72 -38 -94	C	AW53-88
	16,000	500	+200 -125	16,000 16,000	300 400	0-400 0-400	-30 -72 -38 -94	C	AW59-30
	16,000	500	+200 -125	16,000 16,000	300 400	0-400 0-400	-30 -72 -30 -94	C	AW59-90
	16,000	400	±180	14,000 16,000	300	+100	-30 -72	C	CME2102
	16,000	400	±180	14,000	300	—	-30 -72	A	CRM171
	16,000	400	±180	14,000 16,000	300	—	-30 -72	A	CRM172
	18,000	400	±180	16,000 18,000	300	—	-30 -72	A	CRM211
	20,000	400	±180	16,000 18,000	300	—	-30 -72	A	CRM212
	16,000	410	+200 -125	14,000	300	0-250 ⁽¹⁾	-40 -86	E	MW43-64†
									MW43-69
	18,000	500	+200 -125	14,000 16,000	300	0-300 ⁽¹⁾	-40 -86	E	MW43-80
	18,000	500	+200 -125	14,000 16,000	300 300	0-300 ⁽¹⁾ 0-300 ⁽¹⁾	-40 -80 -40 -80	E	MW53-20
	18,000	500	+200 -125	14,000 16,000	300 300	0-300 ⁽¹⁾ 0-300 ⁽¹⁾	-40 -80 -40 -80	E	MW53-80

NOTES

1. These tubes have a prefocusing electrode connected to pin 7.
2. This tube can be replaced by an electrostatic-focus tube (17CGP4) without ion trap magnet by the addition of a lead to the focus electrode (pin 6) of the 17CGP4 from a suitable voltage for good focus (i.e. from earth to B+). The focus magnet should be discarded.
3. These tubes can be replaced by an electrostatic focus tube (17CGP4) without ion trap magnet, by disconnecting the lead from pin 7 and connecting it to pin 6 and adjusting the voltage for best focus. The focus magnet should be discarded.
4. Can be replaced by 17BJP4 (without ion trap magnet) if the procedure in Note (3) is followed.
5. Can be replaced by 21CBP4A (without ion trap magnet) if the procedure in Note (3) is followed.
6. Can be replaced by 21BCP4 (without ion trap magnet) if procedure in Note (3) is followed.
7. By replacing 7 pin socket with 12 pin and changing heater voltage, a 17HP4B can be used as a substitute.
8. When replacing a tube requiring an ion trap magnet with one which does not, the ion trap should be discarded.
9. These tubes are direct replacements only when used in parallel heater systems. They cannot be used as replacements if the original tube is used in a 300 ma series string circuit.
10. Design maximum ratings.



C = EXTERNAL COATING

CL = CONDUCTING LAYER

SEMICONDUCTOR CONTENTS DATA

The types of diodes and transistors tabulated in this data represent only part of the listing available. The inclusion of types in this handbook was restricted to those types most likely to be encountered, particularly in entertainment-type equipment.

**For transistor interchangeability
information, see page 114**

SILICON RECTIFIERS

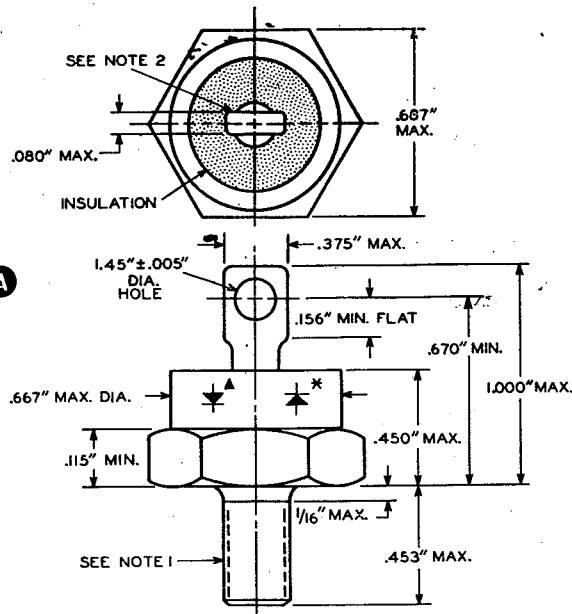
TYPE	ABSOLUTE—MAXIMUM RATINGS						Max. Rev. Current at Max. PIV μ a		OUTLINE
	PIV	RMS Supply Volts*	Forward DC ma		Ambient Temp. °C		25°C	150°C	
			100°C	150°C	Operating	Storage			
1N248C	55	39	—	20,000	175	-65 to +175	—	3,800	A
1N248RC	55	39	—	20,000	175	-65 to +175	—	3,800	A
1N249C	110	77	—	20,000	175	-65 to +175	—	3,600	A
1N249RC	110	77	—	20,000	175	-65 to +175	—	3,600	A
1N250C	220	154	—	20,000	175	-65 to +175	—	3,400	A
1N250RC	220	154	—	20,000	175	-65 to +175	—	3,400	A
1N440B	100	70	500	250	165	-65 to +175	0.3	100	B
1N441B	200	140	500	250	165	-65 to +175	0.75	100	B
1N442B	300	210	500	250	165	-65 to +175	1.0	200	B
1N443B	400	280	500	250	165	-65 to +175	1.5	200	B
1N444B	500	350	425	0	150	-65 to +175	1.75	200	B
1N445B	600	420	400	0	150	-65 to +175	2.0	200	B
1N536	50	35	500	250	165	-65 to +175	5.0	400	B
1N537	100	70	500	250	165	-65 to +175	5.0	400	B
1N538	200	140	500	250	165	-65 to +175	5.0	300	B
1N539	300	210	500	250	165	-65 to +175	5.0	300	B
1N540	400	280	500	250	165	-65 to +175	5.0	300	B
1N547	600	420	500	250	165	-65 to +175	5.0	350	B
1N1095	500	350	500	250	165	-65 to +175	5.0	300	B
1N1195A	300	212	—	20,000	175	-65 to +175	—	3,200	A
1N1195RA	300	212	—	20,000	175	-65 to +175	—	3,200	A
1N1196A	400	284	—	20,000	175	-65 to +175	—	2,500	A
1N1196RA	400	284	—	20,000	175	-65 to +175	—	2,500	A
1N1197A	500	355	—	20,000	175	-65 to +175	—	2,200	A
1N1197RA	500	355	—	20,000	175	-65 to +175	—	2,200	A
1N1198A	600	424	—	20,000	175	-65 to +175	—	1,500	A
1N1198RA	600	424	—	20,000	175	-65 to +175	—	1,500	A
1N1763	400	140†	500†	—	100	-65 to +150	100	1,000▲	B
1N1764	500	175†	500†	—	100	-65 to +150	100	1,000▲	B
1N2858	50	35	500	—	125	-65 to +125	—	400▲	B
1N2859	100	70	500	—	125	-65 to +125	—	400▲	B
1N2860	200	140	500	—	125	-65 to +125	—	400▲	B
1N2861	300	210	500	—	125	-65 to +125	—	300▲	B
1N2862	400	280	500	—	125	-65 to +125	—	300▲	B
1N2863	500	350	500	—	125	-65 to +125	—	300▲	B
1N2864	600	420	500	—	125	-65 to +125	—	900▲	B

*Resistive or Inductive Load.

†Capacitor input to filter.

‡At 75°C.

▲At 100°C.



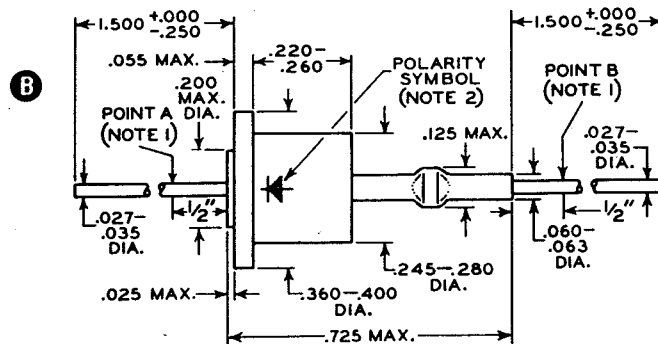
▲ POLARITY SYMBOL FOR TYPES 1N248C, 1N249C, 1N250C, 1N1195A, 1N1196A, 1N1197A AND 1N1198A

* POLARITY SYMBOL FOR TYPES 1N248RC, 1N249RC, 1N250RC, 1N1195RA, 1N1196RA, 1N1197RA AND 1N1198RA

NOTE 1: Must withstand torque of 30 inch-pounds applied to 1/4-28 UNF-2A nut assembled on thread.

NOTE 2: Angular orientation of this terminal undefined.

NOTE 3: Device can be used in any position.



DIMENSIONS IN INCHES

NOTE 1: Do not dip-solder beyond points A and B.

NOTE 2: Arrow indicates direction of forward (easy) current flow as indicated by d c ammeter.

TRANSISTORS

TYPE AND OUTLINE	APPLICATION GUIDE	TYPICAL OPERATION		MAXIMUM RATINGS			CHARACTERISTICS			
		Supply Volts	Collector Current (ma)	Collector - Base Volts	Emitter - Base Volts	Dissipation at 25°C (mw)	h_{re}	h_{FE}	Max. Power Gain (db)	Alpha Cut-off Frequency (Mc)
2N109 A	Electrically identical with 2N217									
2N139 A	Electrically identical with 2N218									
2N140 A	Electrically identical with 2N219									
2N175 A	Electrically identical with 2N220									
2N176 C	AF Power Amplifier	-14.4	-500	-40	-10	10,000▼	—	63	35.5	—
2N217 D	Large Sig. AF Amp.	-9	-2●	-25	-12	150	—	75	33●	—
2N217S D	Large Sig. AF Amp.	-9	-3●	-25	-12	250†	—	75	33●	—
2N218 D	455Kc IF Amplifier	-9	-1	-16	-12	80	48	—	37	4.7
2N219 D	B/C Band Converter	-9	-0.6	-16	-12	80	48	—	30	7
2N220 D	Low Noise AF Amp.	-4	-0.5	-10	-10	50	65	—	43	0.85
2N247 B	RF Amp. to 10 Mc	-9	-1	-35	-1	80	60	—	45□	30
2N269 D	Computer Switching	—	—	-25	-12	120	—	50	—	13
2N269S D	Computer Switching	—	—	-15	-12	80	140	—	—	20
2N270 B	Large Sig. AF Amp.	-9	-2●	-25	-12	250	—	70	32●	—
2N301 C	AF Power Amplifier	-14.4	-900	-40	-10	11,000▼	—	70	33	—
2N301A C	AF Power Amplifier	-14.4	-900	-40	-10	11,000▼	—	70	33	—
2N351 C	AF Power Amplifier	-14.4	-700	-40	-10	10,000▼	—	65	33.5	—
2N370 B	RF Amp. to 20 Mc	-12	-1	-20	-1.5	80	60	—	50.5□	30
2N371 B	RF Osc. to 20 Mc	-12	-1	-20	-0.5	80	60	—	—	30
2N372 B	Mixer to 20 Mc	-12	-1	-20	-0.5	80	60	—	50.5□	30
2N373 B	455Kc IF Amplifier	-12	-1	-25	-0.5	80	60	—	57	30
2N374 B	B/C Band Converter	-12	-0.6	-25	-0.5	80	60	—	40	30
2N376 C	AF Power Amplifier	-14.4	-700	-40	-10	10,000▼	—	78	35	—
2N405 A	Electrically identical with 2N406									
2N406 D	AF Driver Amp.	-6	-1	-20	-2.5	150	35	—	43	0.65
2N407 A	Electrically identical with 2N408									
2N408 D	Large Sig. AF Amp.	-9	-2●	-20	-2.5	150	—	65	33●	—
2N409 A	Electrically identical with 2N410									
2N410 D	455Kc IF Amplifier	-9	-1	-13	-0.5	80	48	—	38	6.8
2N411 A	Electrically identical with 2N412									
2N412 D	B/C Band Converter	-9	-0.6	-13	-0.5	80	75	—	32	10
2N456 C	AF Power Switch/Amp	-28	—	-40	-20	50,000†	—	52	—	—
2N457 C	AF Power Switch/Amp	-28	—	-60	-20	50,000†	—	52	—	—
2N544 B	B/C Band RF Amp.	-12	-0.5	-18	-1	80	60	—	47.3□	30
2N591 D	AF Driver Amp.	-14.4	-2	-32	-1	150	70	—	41	0.7
2N640 B	B/C Band RF Amp.*	-12	-1	-34	-1	80	60	—	47.5	42
2N641 B	455Kc IF Amplifier*	-12	-1	-34	-1	80	60	—	60	42
2N642 B	B/C Band Converter*	-12	-0.6	-34	-1	80	50	—	50	42
2N1632 D	B/C Band RF Amp.	-12	-1	-34	-0.5	80	80	—	47.7	45
2N1634 D	455Kc IF Amp.	-12	-1	-24	-0.5	80	75	—	55.7	40
2N1636 D	B/C Band Converter	-12	-0.65	-34	-0.5	80	75	—	36	45
2N1637 D	B/C Band RF Amp.*	-12	-1	-34	-1.5	80	80	—	47.7□	45
2N1638 D	455Kc IF Amp.*	-12	-2	-34	-0.5	80	75	—	61.5	40
2N1639 D	B/C Band Converter*	-12	-0.65	-34	-0.5	80	75	—	37	45

● Two Transistors, Class B

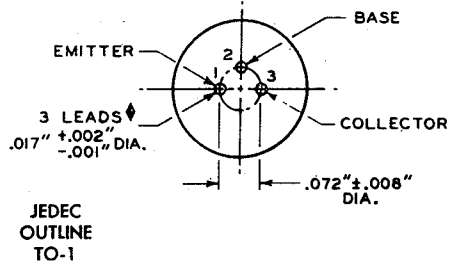
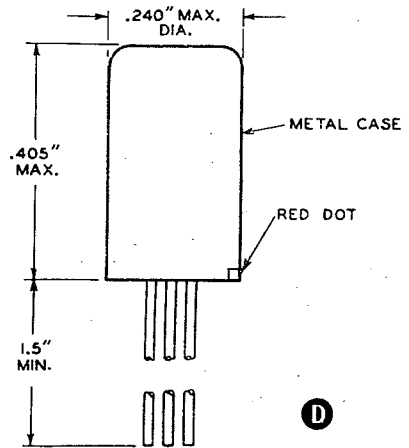
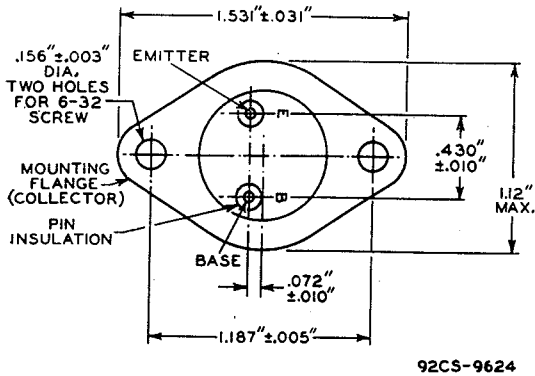
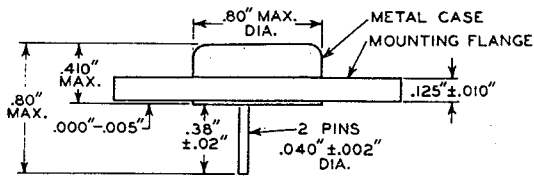
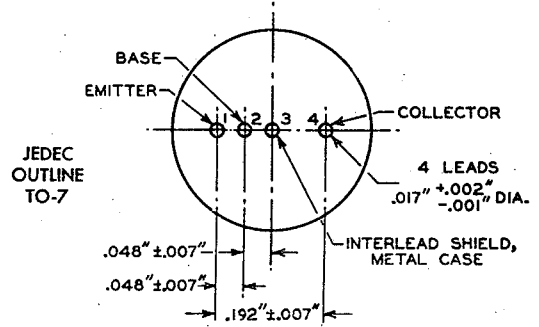
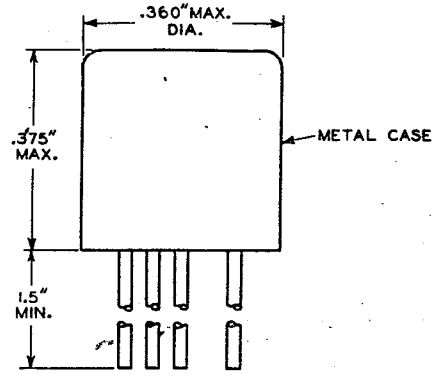
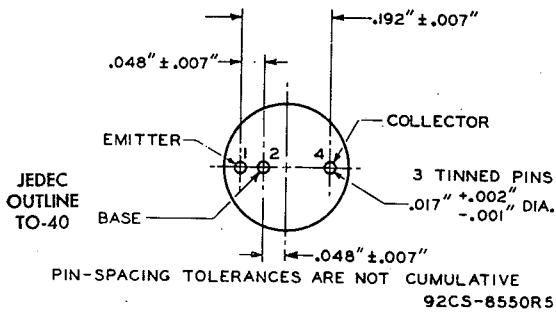
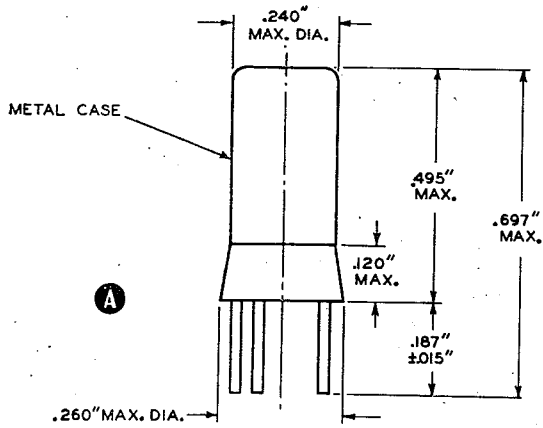
† With Heat Sink

□ At 1.5 Mc

‡ At $T_f = 25^\circ\text{C}$

* For AM Auto Receivers

▼ At $T_f = 80^\circ\text{C}$ h_{re} = Small Signal Current Gain at 1 Kc h_{FE} = Large Signal DC Current Gain



TRANSISTOR INTERCHANGEABILITY GUIDE

This listing is to be used as a guide only. Types shown as replacements are not necessarily electrically and physically identical with the type to be replaced except where marked with an asterisk (*). For more complete information on transistor interchangeability, consult published data on the relevant types.

In the presentation of this list, types with a "2N" prefix are listed first, according to type number. These are followed by miscellaneous types, in which the letters in the type number are ignored for the purpose of arrangement, and the type is placed in the list in a position determined by the numerals in the type number.

KEY TO SYMBOLS

* Denotes direct interchangeability.

† Denotes discontinued type.

‡ 2N247 and 2N274 are identical except for case size and interlead capacitances.

• This indicates that the replacement transistor shown is a flying lead type, and must be soldered into the circuit. This can be done in many cases by passing the leads through the appropriate socket holes, and soldering the connections on the underside.

Type	Replacement	Type	Replacement	Type	Replacement
2N34†	2N408•	2N76	2N217•	2N130A	2N105
2N34A†	2N408•	2N77†	2N105*	2N131A	2N105
2N35†	2N647	2N79†	2N331	2N132	2N105
2N36	2N217	2N85	2N217•	2N132A	2N105
2N37	2N408	2N86	2N217•	2N133	2N220•
2N38	2N408	2N87	2N217•	2N133A	2N220•
2N38A	2N408	2N88	2N105	2N135	2N218•
2N39	2N217	2N89	2N105	2N136	2N218•
2N40	2N217	2N90	2N105	2N137	2N219•
2N41†	2N105	2N94	2N585	2N138	2N406
2N42	2N217	2N96†	2N331	2N138A	2N406
2N43	2N217•	2N104	2N217•	2N138B	2N270
2N43A	2N331	2N105	2N105*	2N139	2N218•
2N44	2N217•	2N106	2N217•	2N140	2N219•
2N44A	2N217•	2N107	2N406	2N155	2N301*
2N45	2N217•	2N109	2N217•	2N156	2N301
2N46†	2N105	2N111	2N218	2N157	2N561
2N47	2N105	2N111A	2N218	2N157A	2N1014
2N48	2N105	2N112	2N218	2N167	2N1030
2N49	2N105	2N112A	2N218	2N173	2N301
2N54	2N217•	2N113	2N218•	2N175	2N220•
2N55	2N217•	2N114	2N219•	2N176	2N301
2N56	2N217•	2N115	2N270	2N180	2N217
2N59	2N270	2N116	2N220•	2N181	2N270
2N60	2N270	2N123	2N404	2N185	2N270
2N61	2N270	2N125	2N585	2N186	2N217
2N62	2N217•	2N126	2N585	2N186A	2N270
2N63	2N217	2N128	2N247‡	2N187	2N217•
2N64	2N217	2N129	2N373	2N187A	2N270
2N65	2N217	2N130	2N105	2N188	2N217•

Type	Replacement	Type	Replacement	Type	Replacement
2N188A	2N270	2N271	2N404	2N375	2N561
2N189	2N408	2N271A	2N404	2N376	2N376*
2N190	2N408	2N272	2N217•	2N376A	2N301
2N191	2N270	2N273	2N217•	2N377	2N1090
2N192	2N270	2N274	2N274*‡	2N378	2N561
2N195	2N217	2N279	2N217	2N379	2N561
2N196	2N217	2N280	2N217	2N380	2N561
2N197	2N217	2N281	2N217	2N381	2N270
2N198	2N217	2N283	2N217	2N382	2N270
2N199	2N217•	2N285	2N301	2N383	2N270
2N200	2N331	2N285A	2N301	2N384	2N384*
2N204	2N331	2N296	2N301A	2N385	2N1090
2N205	2N331	2N297A	2N457	2N386	2N301A
2N206†	2N331*	2N301	2N301*	2N388	2N1090
2N207	2N105	2N301A	2N301A*	2N394	2N404
2N207A	2N105	2N302	2N269	2N395	2N581
2N207B	2N105	2N303	2N269	2N396	2N404
2N215	2N217	2N307	2N301*	2N397	2N582
2N217	2N217*	2N307A	2N301*	2N398	2N398*
2N218	2N218*	2N308	2N373	2N399	2N456
2N219	2N219*	2N309	2N373	2N400	2N456
2N220	2N220*	2N310	2N373	2N401	2N456
2N223	2N270	2N311	2N404	2N402	2N406
2N224	2N270	2N312	2N585	2N403	2N217
2N226	2N270	2N315	2N578	2N404	2N404*
2N231	2N218	2N316	2N579	2N405	2N406•
2N232	2N218	2N317	2N582	2N406	2N406*
2N234	2N301*	2N319	2N270	2N407	2N408•
2N234A	2N301*	2N320	2N270	2N408	2N408*
2N235	2N301*	2N321	2N270	2N409	2N410•
2N235A	2N301*	2N322	2N406	2N410	2N410*
2N235B	2N301A	2N323	2N270	2N411	2N412•
2N236A	2N301	2N324	2N408•	2N412	2N412*
2N236B	2N301A	2N325	2N301	2N413	2N218
2N236A	2N301	2N326	2N301	2N413A	2N218
2N237	2N220	2N331	2N331*	2N414	2N218
2N238	2N217	2N344	2N274‡	2N414A	2N218
2N240	2N582	2N345	2N274‡	2N415	2N374
2N241	2N217	2N346	2N384	2N415A	2N374
2N241A	2N270	2N350	2N301	2N416	2N247‡
2N242	2N301A*	2N351	2N351*	2N417	2N247‡
2N247	2N247*‡	2N351A	2N301	2N418	2N301
2N248	2N247‡	2N352	2N301*	2N419	2N561
2N249	2N270	2N353	2N301*	2N420	2N561
2N250	2N301*	2N356†	2N585	2N421	2N561
2N251	2N301A*	2N357†	2N1090	2N422	2N217
2N252	2N374	2N358†	2N1091	2N425	2N404
2N255	2N301*	2N367	2N406	2N426	2N578
2N256	2N301*	2N368	2N217	2N427	2N579
2N257	2N301*	2N369	2N217	2N428	2N580
2N265	2N408	2N370	2N370*	2N438A	2N585
2N267†	2N247‡	2N371	2N371*	2N439A	2N1090
2N268	2N301A	2N372	2N372*	2N440A	2N1090
2N269	2N269*	2N373	2N373*	2N444	2N585
2N270	2N270*	2N374	2N374*	2N445	2N585

Type	Replacement	Type	Replacement	Type	Replacement
2N446	2N1090	2N606	2N384	2N1040	2N1183B
2N447	2N1091	2N607	2N384	2N1041	2N1183C
2N456	2N456*	2N608	2N384	2N1043	2N561
2N457	2N457*	2N609	2N217	2N1044	2N561
2N458	2N561	2N610	2N217	2N1045	2N1014
2N460	2N331	2N611	2N217	2N1058	2N412
2N461	2N331	2N612	2N217	2N1059	2N270
2N464	2N270	2N613	2N270	2N1066	2N1066*
2N465	2N270	2N614	2N373	2N1067	2N1483
2N466	2N270	2N615	2N373	2N1068	2N1483
2N481	2N371	2N617	2N374	2N1069	2N1487
2N482	2N373	2N618	2N561	2N1070	2N1489
2N483	2N373	2N623	2N645	2N1090	2N1090*
2N484	2N373	2N628	2N561	2N1091	2N1091*
2N485	2N374	2N629	2N561	2N1092	2N1092*
2N486	2N374	2N630	2N1014	2N1097	2N217•
2N499	2N371	2N631	2N408	2N1098	2N217•
2N504	2N373	2N632	2N217	2N1101	2N647
2N511	2N456	2N633	2N270	2N1102	2N647
2N511A	2N457	2N635	2N1091	2N1144	2N217•
2N511B	2N561	2N636	2N1091	2N1145	2N217•
2N518	2N404	2N637	2N561	2N1159	2N1014
2N519	2N578	2N637A	2N561	2N1160	2N1014
2N520	2N578	2N637B	2N561	2N1172	2N301A
2N521	2N579	2N638	2N561	2N1177	2N1177*
2N522	2N580	2N638A	2N561	2N1178	2N1178*
2N523	2N643	2N638B	2N561	2N1179	2N1179*
2N524	2N586	2N639	2N561	2N1180	2N1180*
2N525	2N586	2N639A	2N561	2N1183	2N1183*
2N526	2N586	2N639B	2N561	2N1183A	2N1183A*
2N527	2N586	2N640	2N640*	2N1183B	2N1183B*
2N536	2N578	2N641	2N641*	2N1184	2N1184*
2N544	2N544*	2N642	2N642*	2N1184A	2N1184A*
2N554	2N301*	2N643	2N643*	2N1184B	2N1184B*
2N559	2N645	2N644	2N644*	2N1193	2N270
2N561	2N561*	2N645	2N645*	2N1202	2N561
2N576	2N585	2N647	2N647*	2N1224	2N1224*
2N576A	2N585	2N649	2N649*	2N1225	2N1225*
2N578	2N578*	2N659	2N578	2N1226	2N1226*
2N579	2N579*	2N660	2N643	2N1264	2N370
2N580	2N580*	2N661	2N643	2N1265	2N408
2N581	2N581*	2N662	2N579	2N1291	2N301
2N582	2N582*	2N705	2N1300	2N1293	2N301A
2N583	2N583*	2N1010	2N1010*	2N1295	2N561
2N584	2N584*	2N1014	2N1014*	2N1297	2N1014
2N585	2N585*	2N1016A	2N1487	2N1300	2N1300*
2N586	2N586*	2N1016B	2N1488	2N1301	2N1301*
2N591	2N591*	2N1017	2N582	2N1395	2N1395*
2N597	2N578	2N1021	2N1014	2N1396	2N1396*
2N598	2N579	2N1022	2N1014	2N1397	2N1397*
2N599	2N580	2N1023	2N1023*	2N1425	2N1425*
2N602	2N643	2N1031	2N561	2N1426	2N1426*
2N603	2N644	2N1031A	2N561	2N1431	2N270
2N604	2N645	2N1038	2N1183	2N1432	2N274
2N605	2N384	2N1039	2N1183A	2N1479	2N1479*

Type	Replacement	Type	Replacement	Type	Replacement
2N1480	2N1480*	OC28	2N561	TS176	2N301*
2N1481	2N1481*	OC29	2N301A	206	2N105
2N1482	2N1482*	OC30	2N301	GT222	2N215
2N1483	2N1483*	V30/10P	2N301	300	2N217
2N1484	2N1484*	V30/20P	2N301	301	2N217
2N1485	2N1485*	OC32	2N217•	302	2N217
2N1486	2N1486*	TS32	2N270	310	2N217
2N1487	2N1487*	OC33	2N217•	350	2N217
2N1488	2N1488*	OC34	2N217•	352	2N217
2N1489	2N1489*	T34A	2N105	353	2N217
2N1490	2N1490*	T34B	2N105	TS620	2N218•
AO1	2N218	T34C	2N105	TS621	2N219•
HA1	2N105	T34D	2N217•	CK721	2N217•
J1	2N217•	T34E	2N217•	CK722	2N217•
JP1	2N217•	T34F	2N217•	CK725	2N217•
TS1	2N406	GT38	2N105	CK727	2N217•
A2	2N274‡	OC41	2N581	CK751	2N217•
HA2	2N105	OC42	2N218	CK759	2N218•
J2	2N217•	OC44	2N219	GT759	2N218•
TS2	2N408	OC45	2N218	CK760	2N218•
HA3	2N105	OC57	2N105	GT760	2N218•
HS3	2N269	OC58	2N105	CK761	2N218•
J3	2N217•	OC59	2N105	GT761	2N218•
TS3	2N217	OC60	2N105	CK762	2N219•
HS4	2N269	OC65	2N105	GT762	2N219•
V6R2	2N412	OC66	2N105	CK766	2N219•
V6R4	2N412	OC70	2N406	CK766A	2N219•
V6R4M	2N219	OC71	2N408	830	2N219•
8D	2N218	ZJ71	2N247‡	CK872	2N408•
8E	2N218	OC72	2N217•	CK878	2N270
8F	2N218	ZJ72	2N247‡	1032	2N217•
HA8	2N105	OC73	2N217	1033	2N217•
HA9	2N105	ZJ73	2N247‡	1034	2N217•
10A	2N270	OC74	2N270	1035	2N217•
10B	2N270	OC75	2N217	1036	2N217•
10C	2N270	OC76	2N586	T1040	2N301*
AR10	2N301	OC77	2N398	T1041	2N301*
HA10	2N105	GT81	2N217•	CTP1104	2N301*
TS13	2N408	GT81H	2N105	CTP1109	2N301*
CK13	2N247‡	SB100	2N247‡	CTP1132	2N561
ZJ13	2N217•	GT109	2N217•	CTP1135	2N561
CK14	2N247‡	GT122	2N404	CTP1136	2N561
GT14	2N217	DR126	2N105	T1164	2N384
GT14H	2N105	DR128	2N105	T1166	2N384
TS14	2N217	OC139	2N356	1320	2N217•
V15/20P	2N301	OC140	2N357	1330	2N217•
OC16	2N301	OC141	2N358	1340	2N217•
OC16G	2N301	TS161	2N217•	1350	2N217•
CK17	2N247‡	TS162	2N217•	1360	2N217•
GT20	2N217•	TS163	2N217•	1390	2N218•
GT20H	2N105	TS164	2N217•	1400	2N218•
MN24	2N301	TS165	2N217•	1410	2N218•
MN25	2N301	TS166	2N220•	L5108	2N247‡
V25/50B	2N217	OC170	2N384	L5121	2N247‡
MN26	2N301	OC171	2N384	L5122	2N247‡

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