Federal

Selenium Rectifier Replacement Guide

Second Edition

(Excerpts)

Published 1955

RADIO

MANUFACTURER & MODEL	PART NUMBER	FEDERAL PART NUMBER
ADMIRAL		
4R11, 4R12 (Ch. 4R1), 4T11, (Ch. 4T1), 4W18, 4W19 (Ch. 4W1), 4Z12 (Ch. 4Z1)	93A1-6	1002A(1263A)
5F11, 5F12 (Ch. 5F1), 6C11 (Ch. 6C1)	93A1-4	1003A
6Q11, 6Q12, 6Q13, 6Q14 (Ch. 6Q1), 6R11 (Ch.6R1)	93A1-2	1004A
6W11, 6W12 (Ch. 6W1)	93A1-2	1004A
6Y18, 6Y19 (Ch. 6Y1)	93A1-4	1003A
7P32, 7P33, 7P34, 7P35 (Ch. 5H1)	93A1-2	1004A
AIRADIO		
3100	RT-1013	1004A
AIRCASTLE		
DM-700, EV760, G-521		1003A
G-725	ED-2	1005A
K1	SL-650-M	1003A
PM-358	2723	1003A
SC-448	3004	1002A(1263A)
TD-6	SL-650-M	1003A
WRA1-A	48S001	1002A(1263A)
WRA-4M	A-801	1002A(1263A)
472.JP24, 472.JP25, 472.MP24, 472.MP25	A-4110-33	1002A(1263A)
652.327SA	SE-1000	1002A(1263A)
738.B5400UL		1002A(1263A)
5003, 5004, 5005, 5006, 5020	SR-1	1002A(1263A)
5022	SR-2	1003A
5024, 5025, 5027	SR-1	1002A(1263A)
10005	RS-10000	1004A
11305	A83-391	1003A
121104, 121124	A83-463	1005A
127084	A83-391	1003A
131504	A83-463	1005A
147114	A83-568	1003A

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AIRCASTLE (Continued)		
652.351		
652.327 S.A.	SE-1000	1003A
AIR KING		
A-510		1002A(1263A)
A-520	51133	1004A
AIRLINE		
G5E-1077A	57E15	1003A
05GHM-1061A	PM3	1004A
15BR-1547A, 15BR-1548A, 15BR-1549A	21J-19594	1004A
15GHM-935		1003A
15GHM-936A, 15GHM-937A	CM112	1002A(1263A)
15GHM-1070A	AM3	1101
35GHM-1073	34X100	1003A
35GHM-1074	34X103	1002A
25BR-1542A	21J-19594	1002A
25BR-1549B	21J-19594	1002A
64WG-1050A, B, C, D	66X7	1004A
64WG-1052A, B	25A1019	1004A
74KR-1210A	26002	1004A
35WG-2767A	66X10	
74WG-1050C, D	66X7	1004A
74WG-1052B, 74WG-1054A, B	25A1019	1004A
74WG-1056A, 74WG-1057A	66X7	1004A
84WG-1060A, C	66X8	1003A
94BR-1533A, 94BR-2704A, 94BR-2741A, B	A-21J-12775	1004A
94WG-1059A	66X7	1004A
ALDENS		
1562, 1636L	ED-2	1005A
1800 Series	SR-75	1003A
	SR-1	1003A

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ALDENS (Continued)		
1800 Series (continued)	ED-1	1003A
ARVIN		
150TC-151TC (Ch. RE-228-1) Late	A20207-2	1004A
182TFM (Ch. RE-237)	A20207-3	1005A
241P (Ch. RE-244, RE-254, RE-255, RE-256, RE-259)	A20207-1	1003A
244P (Ch. RE-244, RE-254, RE-255, RE-256, RE-259), 250-P (Ch. RE-248)	A20207-1	1003A
280TFM, 281TFM (Ch. RE-253)	A20207-3	1005A
250P (Ch. RE-267), 350-PB (Ch. RE-267-1), 350-PL (Ch. RE-267-2), 351P (Ch. RE-267), 351-PB (Ch. RE-267-1), 351-PL (Ch. RE-267-2), 352-PL, 353-PL (Ch. RE-267-2)	C20207-2	1004A
360TFM, 361TFM (Ch. RE-260)	C20207-3	1005A
650-P (Ch. RE-292)		1003A
2410P (Ch. RE-244, RE-254, RE-255, RE-256, RE-259)	A20207-1	1003A
854D (RE-372)	A20207-5	1003A
AUTOMATIC		
Tom Thumb Buddy		1003A
Tom Thumb Personal ATTP	SR-100	1004A
C51, C54	S-1	1101A
C-60X, C-65X	SR-75	1003A
BELL SOUND SYSTEMS		
440L, 440S "Belfone"		1004A
2145,A		1006A
BENDIX		
69B8, 69M8, 69M9, 75B5, 75M8, 75P6, 75W5	QR0S01	1004A
697A	QR0S00	1005A
BROCINER		
CA-2		1263A
BROOK ELECTRONICS INC.		
10C3		1004A
CAPEHART		
P213 (Ch. CR-85)	650150D-5	1003A
1P-55 (CR-148)	650150D-5	1003A

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CBS COLUMBIA		
202		1002A(1263A)
525	PA-51160	1003A
5220 (4P1)	62,000021	1003A
CHANCELLOR		
35P		1004A
CLARION		
147 Series	A-83-568	1003A
11011, 11305, 11411-N	A83-391	1003A
12110M	A83-463	1005A
12708	A83-391	1003A
13101	A83-463	1005A
COLUMBIA		
202		1002A(1263A)
CORONADO		
RA33-9856D	SR-65	1263A
RA37-43-9855	508305	1003A
05RA4-43-9876A, 9876A	83-642	1002A(1263A)
35RA-43-9856A	83-642	1002A(1263A)
CROSLEY		
E30BE, GN, MN, TN (Ch. 30E, 30E-1)	B-145370	1004A
9-302	B-143883-2	1003A
10-307M, 10-308, 10-309	W-145429	1002A(1263A)
11-126U, 11-127U, 11-128U, 11-129U (Ch. 312)	B-145370	1004A
11-3-1U, 11-302U, 11303U, 11-304U, 11-305U (Ch. 303)	W-145429	1002A(1263A)
DAVID BOGEN		
H010		(1263A)
"TWIN"	H243	1101A
11D, 11U, 21D, 21U		1002A(1263A)
FC-1 Control		1004A
FR-1 Remote		1004A
PS-1 Power		1004A
BB-1A		1002A(1263A)
B1B-1		1005A
AMB-1		1014A

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DAVID BOGEN (Continued)		
RC and PR	H370	1002A(1263A)
UCT	H375	1002A(1263A)
BOGEN-INTERCOM		
TWIN	H243	1002A(1263A)
DELCO		
R-1410	121683	1003A
DEWALD		
B-504, B-515	8018A	1003A
D-E517A, D-508,A	8018B	1003A
D-517	8018	1003A
H-527	8018	1003A
DUKANE		1101A
4C25 Flexiphone	595-2	1101A
11A55FF, 11B55	595-5 and 595-4	1102A(1263A) and 1005A
DYNAVOX		
3-P-801		1003A
ECA		
131	A-1383	1003A
EDWARDS		
Fidelotuner		1003A
ELECTONE		
T5TS3		1003A
EMERSON		
556, 557 (Ch. 120018B), 565 (Ch. 120018B)	817101	1004A
569A (Ch. 120062A)		1002A(1263A)
605 (Ch. 120076B)	817101	1004A
613A (Ch. 120085A, B)	817012	1002A(1263A)
679B (Ch. 130116-B)	817101	1004A
705A, B (Ch. 120155A, B)	817024	1002A(1263A)
745B (Ch. 120176-B)	817025	1003A

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EMERSON (Continued)		
746B (Ch. 120177-B)	817025	1003A
FADA		
P80	112.6	1004A
P111, P130	112.18	1003A
795	112.6	1004A
FIRESTONE (Air Chief)		
4-A-12 (Code 213-8-8370)	A-58612	1004A
4-A-88	SL650	1002A(1263A)
4-A-133 (Code 1-4-UL-5 X 5)	SE-1002	1005A
4-C-5 (Code 291-7-574)	57E1-2	1002A(1263A)
4-C-13 (Code 332-8-140623)	A83-568	1003A
4-C-16, 4-C-17	57E1-4	1003A
4-C-18	83-642	1003A
4-C-19, 4-C-20	N-8331	1002A(1263A)
4-C-21 (Code 120-2-C51-U)	-	1003A
4-C-24	S1	1003A
FISHER		
50-A	SR-3180	1159
50-C, -CH	SR-3078	1016
GAROD		
5D-4, 5D-5	36.111	1003A
5K-1	36.130	1004A
GENERAL ELECTRIC		
140	REX-004	1002A(1263A)
143, 145	REX-005	1003A
150	RER-001	1003A
160	REX-001	1003A

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GENERAL ELECTRIC (Continued)		
165, 218, 218 "H"	RER-001	1003A
250, 260	REX-001	1004A
408, 409, 440	RER-010	1004A
601, 603, 604, 605, 606, 607, 608, 630	REX-005	1003A
610, 611, 614, 615, 650	RER-001	1003A
612, 613	K68J102-1	1003A
GENERAL TELEVISION		
23A6	5-2	1003A
GRANCO		
610		1101A
GRANTLINE		
508-7	SR-1	1002A(1263A)
HALLICRAFTERS		
S-72, S-72L	27A151	1005A
S-81, S-82	27A161	1004A
TW-25 (Runs 1 & 2)	27A172	1003A
TW-500	27B190	1004A
TW-1000 (Run 1), TW-2000	27A161	1004A
5R24	27A162	1002A(1263A)
8R40, 8R40C	27A155	1090A(1236A)
HOFFMAN		
A-700 (Ch. 110S)	9517	1004A
HOWARD		
474	SR-0003	1003A
HUDSON ELECTRONICS		
332H		1002A(1263A)
JACKSON		
JP-20		1002A
JEFFERSON-TRAVIS		
MR3		1003A

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JEWEL		
500A, B, C 501A, B, C, 502A, B, C 503A, B, C, 504A, B, C, 505A, B, C, 505 "Pin-UP" 801 (Trixie)		1002A(1263A)
949		1003A
5010		1002A(1263A)
5050	73-3	1002A(1263A)
KNIGHT		
4B-170, 5B160, 5B17)	SR-1	1003A
5B-185	A83-391	1003A
5C-290	SR-1	1003A
6G-400	57E1	1004A
6K718		1003A
7B-220, 7C220	57E1	1004A
7D-405	RF849	1003A
449	57E1	1004A
LAFAYETTE		
J4		1005A
1-422	175-1	1003A
1-427		1005A
LEARADIO		
WC-311-D	62094 and 61191	1006A and 1004A
LEWYT		
711		1004A
MAGNACORD		
AD-1R	2044-8	1004A
MAGUIRE		
661,611A	29375	1004A
MAJESTIC		
5M1	C-39.206	1003A
MANTOLA (B.F. Goodrich Co.)		
R652, R652N	93A1-2	1004A

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MANTOLA (Continued)		
R-76162, R-76262 (Fact. No. 7160-17)	A58612	1004A
MASCO		
D37, D37R, DC37R		1002A(1263A)
EMM-6		1002A(1263A)
1M-10, JM-10		1004A
JMP-6, JMP-12		1002A(1263A)
LD37, LD37R		1002A(1263A)
MB-2	RS-40	1002A(1263A)
MB-3	RS-65	1002A(1263A)
Midgetalk		1002A(1263A)
T-16		1002A(1263A)
WF-1A		1004A
52, 52C, 52CR, 52L, 52LR, 52R		1002A(1263A)
MECK		
CM-500		1003A
DE-640, DF-641	RS-10000	1004A
EV-760		1003A
5D7/WL18		1003A
MEISSNER		
611, 661	29375	1004A
MIDWEST		
P6, PB-6	CR-1	1003A
MINERVA		
410, 411	730001	1004A
MITCHELL		
1256	N-8331	1002A
1276, 1287	N-8331	1002A

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MANUFACTURER & MODEL	PART NUMBER	FEDERAL PART NUMBER
MONITOR		
M-510 (Fact No. 472)		1004A
MOTOROLA		
5A7 (Ch. HS-62) 5A7A (Ch. HS-62A)	48B478111	1003A
5J1 (Ch. HS-250), 5J1U (Ch. HS-224), 5J2 (Ch. HS-250), 5J2U (Ch. HS-224), 5L1 (Ch. HS-250), 5L1U (Ch. HS-224), 5L2 (Ch. HS-250), 5L2U (Ch. HS-224)	48B791092	1002A(1263A)
5M1, 5M1U, 5M2, 5M2U (Ch. HS-249, HS-223)	48B791072	1002A(1263A)
6L1, 6L2 (Ch. HS-226)	48K692077	1003A
51L1U, 51L2U (Ch. HS-224), 51M1U, 51M2U (Ch. HS-283), 52B1U (Ch. HS-305)	48B791092	1002A(1263A)
52L1, A, 52L2, A, 52L3, A (Ch. HS-327, HS-357), 52M1U, 52M2U, 52M3U (Ch. HS-300)	48B791092	1002A(1263A)
53LC1 (Ch. HS-347, 53LC3 (Ch. HS-347) 54L1 (Ch. HS-414)	48B791092 48B631295	1002A(1263A) 1002A(1263A)
58L11, (Ch. HS-114), 59L11Q, 59L12Q, 59L14Q (Ch. HS-187)	48B478111	1003A
61L1, 61L2 (Ch. HS-226), 62L1U, 62L3U (Ch. HS-308)	48B692077	1003A
63L1, 63L2, 63L3 (Ch. HS-361)	48B478111	1003A
67L11 (Ch. HS-59)	48B470928	1003A
67XM21 (Ch. HS-64)	48B90140	1004A
68L11 (Ch. HS-119)	48B478111	1003A
68T11 (Ch. HS-144)	48B90140	1004A
69L11 (Ch. HS-175)	48B478111	1003A
72XM21 (Ch. HS-303)	48B482807	1005A
77FM21 (Ch. HS-89), 77FM22, 77FM22M, 77FM22WM, 77FM23 (Ch. HS-97)	48B90140	1004A
77XM21, 77XM22, 77XM22B (Ch. HS-102)	48B90140	1004A
78F11, 78F11M (Ch. HS-150), 78F12M (Ch. HS-155)	48B482807	1005A

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MANUFACTURER & MODEL	PART NUMBER	FEDERAL PART NUMBER
78FM21, 78FM21M (Ch. HS-132), 78FM22M (Ch. HS-128)	48B90140	1004A
79FM21, 79FM21B, 79FM21R (Ch. HS-178), 79XM21, 79XM22 (Ch. HS-168), 88FM21 (Ch. HS-133)	48B482807	1005A
53LC1, 53LC2, 53LC3, (Ch. HS-347)	48B791092	1002A(1263A)
OLYMPIC		
HF-500	RF-3160	1005A
7-526	RF-770	1004A
7-622, 7-638	RF-849	1005A
9-542	RF-1744	1003A
OPERADIO		
4A30-A, 4A35, 4A50-A, 4A51-A, 4A55	595-2	1004A
PACKARD-BELL		
471	72001	1003A
PENTRON		
AM-T		1263A
MM4		1263A
PB-A2, PB-1	454-A-6	1002A(1263A)
PHILCO		
B-956, 53-956	34-8003-1	1004A
C-663, C-667 (Code 121)	34-8003-18	1003A
48-1200	CR100	1002A(1263A)
49-101	34-8003	1003A
49-602	34-8003-1	1004A
49-1606, 49-1607, 49-1609, 49-1611	34-8003-1	1004A
50-620	34-8003-1	1004A
50-621	34-8003	1003A
50-925 (Code 123) 50-926	34-8003-2	1005A
50-1720	34-8003-2	1005A
50-1725	34-8003-1	1004A

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51-629, 51-631, 51-632, 51-934	34-8003-1	1004A
52-640, 52-641	34-8003-1	1004A
52-643	34-8003	1003A
52-944	34-8003-1	1004A
53-652	34-8003	1003A
53-656, 53-658	34-8003	1003A
53-956	34-8003-1	1004A
53-958	34-8003-1	1004A
PHILHARMONIC		
349-C		1004A
PHONOLA		
TK-146B	10432	1003A
TK-236		1002A(1263A)
PILOT		
T-570, T-573	110-306	1005A
T-601 Pilotuner	110-318	1004A
PROCIVER		
CA-27A100		1002A(1263A)
RCA VICTOR		
BX6 (Ch. RC1082), BX55 (Ch. RC1088), BX57 (Ch. RC1088A)	74332	1003A
PX600 (Ch. RC1110), 2BX63 (Ch. RC-1115)	74322	1003A
2C511, 2C512, 2C513, 2C514 (Ch. RC-1118,A,B, C)	77292	1263A
2R51, 2R52 (Ch. RC-1119)	77292	1263A
2-S-7 (Ch. RC-1117D)	76871	1101A
2XF91 (Ch. RC-1121)	77519	1004A
2-XF-931, 2, 3, 4 (Ch. RC1121A)	77519	1004A
2XF-931 (Ch. RC1121A), 2XF-932, 2XF-933, 2XF-934, 2XF-935	940267-6	1004A
2-BX (RC-1115)	74322	1003A
3-BX-51, 3-BX-52, 3-BX-53, 3-BX-54 (Ch. RC-1126)	77958	1003A

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3-BX-51, 3-BX-52, 3-BX-53, 3-BX-54 (Ch. RC-1126)	940267-7	1003A
3-BX-675 (RC-112S)	940267-7	1003A
3-BX-675 (RC-1125)	940267-8	1003A
2-S-7 (Ch. RC-11170)	938408-1	1004A
2U57 (Ch. RC-1077A)		1101
3BX-671 (Ch. RC-1125)	78101	1002A
5BX-41 (RC-7147)	77958	1003A
9BX56 (Ch. RC-1068)	74322	1003A
9Y7 (Ch. 1057B)	73009	1005A
45-EY-3 (Ch. RC-136)	75490	1003A
77U (Ch. RC-1057A)	73009	1005A
RADIOETTE		
PR-2		1003A
RANGER		
118		1004A
RAYTHEON		
CR41 (Ch. 4D16-A)	B-21J-19594	1004A
CR42 (Ch. 4D16-A)	B-21J-19594	1003A
PR51	21J-19615	1003A
RAULAND		
2206, 2206H, 2212, 2212H, 2218, 2218H, 2224, 2224H	JR-0013	1004A
REGAL		
FM78	175-2	1005A
747	65-122	1005A
777		1003A
1877, 1878	175-1	1101A
REMLER		
5300B, 5300B1, 53001, 5310	L-30255	1003A
REVERE		
400	(A123-1)	1263A

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ROLAND		
8FT1M		1004A
5P4, 5P2	PR5-65	1002A(1263A)
6P2	RS65T	1002A(1263A)
8XF1, 8XF2, 8XF3-M		1101A
SENTINEL		
1U312PG, 1U312PW	57E4	1003A
1U-316PM, 1U-316PT	57E1-4	1003A
1U-335PG, P1, PM, PW	57E1-5	1003A
1U345P	57E14	1003A
D-3031 (Service B)	57E14	1003A
286PR	57E4 or 57E5	1003A
302-1, 302-T, 302-W	57E1	1004A
312PG, 312PW	57E4	1003A
316PM, 316PT	57E1-4	1003A
335PG, P1, PM, PW	57E1-5	1003A
345P	57E14	1003A
SETCHELL-CARLSON		
447, 449, 458-RD		1003A
469		1004A
SIGNAL		
341-A	370001	1003A
341-T		1003A
SILVERTONE		
25, 27 (Ch. 478.238	SR-2-D	1004A
215 (Ch. 528.174)	T83-642	1002A(1263A)
217, 218 (Ch. 528.174), 220 (Ch. 528.173), 222, 223, 224 (Ch. 528.173), 225 (Ch. 528.171-1)	T83-642	1002A(1263A)
245 (Ch. 548.358-1)	2723	1002A(1263A)
246 (Ch. 137.906)	C10432	1002A(1263A)
1017, 1018 (Ch. 528.210, -1, -2)		1003A

*If stud construction is desired, use code No. 1010 in place of 1028.

Note: Code numbers in parentheses are Federal's Universal Line.
These Federal Selenium Rectifiers may be used in place of standard replacement indicated.

RADIO

MANUFACTURER & MODEL	PART NUMBER	FEDERAL PART NUMBER
SILVERTONE (Continued)		
2200, 2202, 2203 (Ch. 528.229)	T83-642	1002A(1263A)
2215 (Ch. 528.238)	T83-642	1002A(1263A)
2225 (Ch. 528.233)	83-642	1002A(1263A)
2243, 2246 (Ch. 137.914, -1, -2, -3)	C10432	1002A(1263A)
2250 (Ch. 137.915)	C10432	1002A(1263A)
3200, 3202, 3203 (Ch. 528.259)	T83-642	1002A(1263A)
3217 (Ch. 528.265)	T83-642	1002A(1263A)
4225 (Ch. 528.307)	T83-568	1003A
8020 (Ch. 132.841), 8021 (Ch. 132.868)	N20207-3	1003A
4045 (Ch. 528.31R-1)		1004A
8168 (Ch. 109.638)	DA60256	1003A
9161 (Ch. 548.358)	1633	1003A
9270 (Ch. 547.245)	V6558-1	1003A
9280 (Ch. 528.168)	T83-642	1002A(1263A)
SONORA		
WDU-335	N-8331	1002A
WDU-233, WDU-249	N-5885	1003A
WDU-458	N-9541	1004A
WLRU-219A, WLRU-220A, WLRU-245A, 402F	N-6519	1003A
SOUNDVEIW (PROJECTOR)		
SA-63		1005A
SA-63		1003A(1263A)
SPARTON		
150, 151, 152, 155 (Ch. 4E10)	PA4208	1003A
301, 305, 309 (Ch. 4E3)	PA4215A	1003A
1051, 1052 (Ch. 6B9)	PA4204	*1028A
STEELMAN		
602, 6000		1003A
3D2		1002A(1263A)
3AR3		1005A

*If stud construction is desired, use code No. 1010 in place of 1028.

Note: Code numbers in parentheses are Federal's Universal Line.
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MANUFACTURER & MODEL	PART NUMBER	FEDERAL PART NUMBER
SILVERTONE (Continued)		
3S1		1002A(1263A)
151M		1002A(1263A)
602, 6000		1003A
652, 8TF1		1004A
STEWART-WARNER		
A72T1 (Code 9026-A), A72T2 (Code 9026-B), A72T3 (Code 9026-C), A72T4 (Code 9026-D)	504972	1005A
B72CR1 (Code 9038A)	504972	1005A
9151-A	504972	1005A
9153-A	508305	1003A
9175-BU	52148	1263A
9170-B, -C, -D	508305	1003A
STROMBERG-CARLSON		
EP-2	162190	1263A
1200, 1202 (Series 10)	162034	1003A
1204 (Ch. 112021)	162058	1005A
1400, 1500	162034	1003A
SYLVANIA		
430L (Ch. 1-254)	517-0002	1003A
433B, GR, H, LU, RE, YE (Ch. 1-604-1)	517-0005	1003A
TAPEMASTER		
PA-1		1263A
PT-121		1152 2 req'd.
TELECOIN		
M5TS4		1003A
TELEKING		
RKP-53-A		1003A
TELE-TONE		
142, 143, 144, 145, 152	SR-1	1004A

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Note: Code numbers in parentheses are Federal's Universal Line.
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RADIO

MANUFACTURER & MODEL	PART NUMBER	FEDERAL PART NUMBER
TEMPLE		
G-410, G-415	ED-1	1003A
G-521		1004A
G-725	ED-2	1005A
H-415	ED-1	1003A
H-727	ED-2	1005A
TRAV-LER		
5020 (Ch. 800)	SR-1	1004A
5022	SR-2	1003A
5027	SR-1	1004A
5030, 5031	SR-1	1004A
5301, 5305	SR-2	1003A
TRUETONE		
D2418A	21J19594	1003A
D2919 (Fact. No. 6DF21)	A-21J-12775	1004A
D-3120A	21J-19615	1002A(1263A)
D-3130A, B	57E14	1003A
D-3210A	21J-19615	1002A(1263A)
D-3265A	83-642	1002A(1263A)
D-3351, D3352, D3353	508305	1003A
D3630, D3630N	93A1-2	1004A
D3720, D3721 (Fact. 110BX)	A83-391	1003A
D3722 (Fact. 472)		1003A
D3811	A83-391	1003A
D3910 (Fact. No. 140611)	A83-568	1003A
WEBCOR		
B-135-1		1002A(1263A)
B-136-1, F-136-1, T-136-1		1002A(1263A)
WESTINGHOUSE		
H-148, H-148A, H-165, H-185 (Ch. V-2131, V-2131-1), H-195	V-4115	1003A

*If stud construction is desired, use code No. 1010 in place of 1028.

Note: Code numbers in parentheses are Federal's Universal Line.
These Federal Selenium Rectifiers may be used in place of standard replacement indicated.

MANUFACTURER & MODEL	PART NUMBER	FEDERAL PART NUMBER
WESTINGHOUSE (Continued)		
H-204	V-6070	1004A
H-302P5 (Ch. V-2151-1)	V-6558-1	1003A
H-303P4, H-304P4 (Ch. V2153)	V-9446-1	1003A
H-307T7, H-308T7 (Ch. V-2136)	V-9640	1004A
H-309P5, H-309P5U (Ch. V-2156)	V-9558	1003A
H-312P4, H-312P4U, H-313P4, H-313P4U, H-314P4, H-314P4U, H-315P4, H-315P4U, (Ch. V-2153-1)	V-9446-1	1003A
H-316C7 (Ch. V-2136-1), H-317C7 (Ch. V-2136-1)	V-9640	1004A
H-324T7, H-325T7,U (Ch. V-2136-2)	V-9640	1004A
H-326C7, H-328C7,U (Ch. V-2136-4)	V-9640	1004A
H-331P4,U (Ch. V-2164,U), H-332P4, H-333P4, U (Ch. V-2164, U)	V-9446-2	1003A
H-334T7U, H-335T7U (Ch. V-2136-5U)	V-9640	1004A
H-334T7UR (Ch. V-2136-5R)	V-9640	1004A
H-342P5U, H-343P5U (Ch. V-2156-1U), H-348P5, H-349P5 (Ch. V-2156-1U)	V-9446-2	1003A
H-350T7, H-351T7 (Ch. V-2180-1), H-354C7 (Ch. V-2180-2	V-9640	1004A
H-368P5, H-369P5 (Ch. V-2156-1U)	V-9446-2	1003A
H-370T7, H-371T7 (Ch. V-2180-8)	V-9640	1101A
H-373P4	V-11189	1159
H-400P4, H-401P4, H-402P4, H-403P4 (Ch. V-2164-2), H-423P4 (Ch. V-2188), H-405P5 (Ch. V-2156-2)	V-9446-4 V-9446-2	1003A
WILMAK		
W-446 "DENchum"	92A0823	1003A
WOOLAROC		
3-71A	ED-2	1005A
ZENITH		
G-402	212-10	1002A(1263A)

*If stud construction is desired, use code No. 1010 in place of 1028.

Note: Code numbers in parentheses are Federal's Universal Line.
These Federal Selenium Rectifiers may be used in place of standard replacement indicated.

RADIO

MANUFACTURER & MODEL	PART NUMBER	FEDERAL PART NUMBER
ZENITH (Continued)		
G500 (Ch. 5G40)	212-5	1002A(1263A)
G503 (Ch. 5G41)	212-10	1002A(1263A)
G723 (Ch. 7G04), G724(Ch. 7G02), G725 (Ch. 7G01)	212-7	1004A
H-401, G (Ch. 4H40)	212-10	1002A(1263A)
H-500 (Ch. 5H40)	212-5	1003A
H-503, Y (Ch. 5H41)	212-10	1002A(1263A)
H-723 (Ch. 7H04), H-723Z (Ch. 7H04Z), H-723Z1 (Ch. 7H04Z1)	212-7	1004A
H-723Z2 (Ch. 7H04Z2)	212-7 or 212-13	1004A
H724 (Ch. 7H02), H724Z (Ch. 7H02Z), H-724Z1 (Ch. 7H02Z1)	212-7	1004A
H724Z2 (Ch. 7H02Z2)	212-7 or 212-13	1004A 1101A
H725 (Ch. 7G01Z)	212-7	1004A
J402 (Ch. 4J40)	212-10	1002A(1263A)
J504 (Ch. 5J41)	212-5	1003A
J733, G, R, Y (Ch. 7J03)	212-7 or 212-13	1004A
K412G, R, W, Y (Ch. 4K01)	212-5	1003A
K526 (Ch. 5K04)	212-13	1101A
K725, F, G (Ch. 7K01)	212-13	1101A
L403F (Ch. 4L41)	212-5	1003A
L406R (Ch. 4L42)	212-5	1003A
L505F, R, Y (Ch. 5L41)	212-5	1003A
L507 (Ch. 5L42)	212-5	1003A
L600 (Ch. 6L40)	212-13	1101A
L721 (Ch. 7L05)	212-13	1101A

**If stud construction is desired, use code No. 1010 in place of 1028.*

Note: Code numbers in parentheses are Federal's Universal Line.
These Federal Selenium Rectifiers may be used in place of standard replacement indicated.

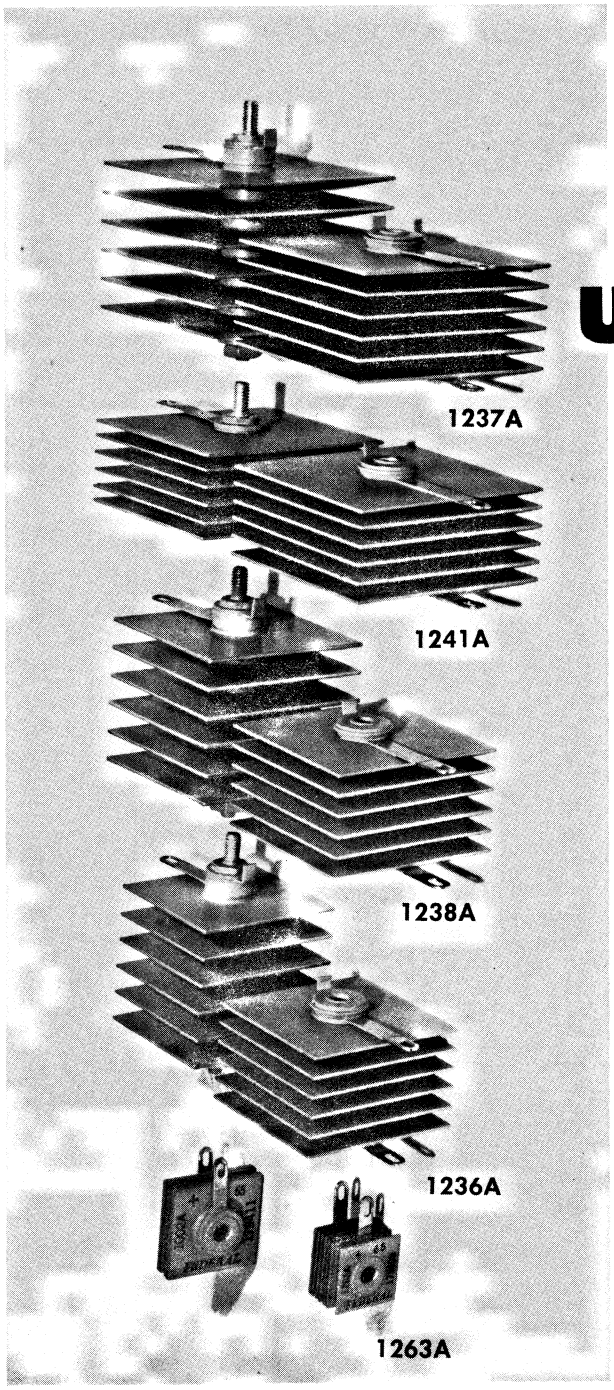
MANUFACTURER & MODEL	PART NUMBER	FEDERAL PART NUMBER
ZENITH (Continued)		
4G800 (Ch. 4E41)	212-2 or 212-4	1003A
4G800WZ, 4G800YZ, 4G800Z (Ch. 4E41Z)	212-2	1003A
4G903, 4G903Y (Ch. 4F40)	212-5 or 212-2	1002A(1263A)
5G003Z (Ch. 5C40Z), 5G003ZZ (Ch. 5C40ZZ)	212-2	1003A
7H820, 7H820W (Ch. 7E01)	212-3 or 212-4	1004A
7H822 (Ch. 7E02), 7H822WZ, 7H822Z (Ch. 7E02Z)	212-3	1004A
7H918 (Ch. 7F03)	212-7	1004A
7H920, 7H920W (Ch. 7F01), 7H921 (Ch. 7F04)	212-3	1004A
7H922 (Ch. 7F02)	212-7	1004A

*If stud construction is desired, use code No. 1010 in place of 1028.

Note: Code numbers in parentheses are Federal's Universal Line.
These Federal Selenium Rectifiers may be used in place of standard replacement indicated.

NOW any selenium rectifier can be replaced with a

Federal



Federal Selenium Rectifiers are listed in Howard W. Sam's Counter-Facts and Photo Facts

Federal's

COMPACTED • EYELET TYPE

UNIVERSAL LINE

meets all replacement needs where size is a factor

ONE SOURCE OF SUPPLY

... Federal's Universal and Regular Lines provide complete coverage of today's selenium rectifier requirements!

Now you can eliminate the problem of *"inventory variety!"*

With Federal's new, smaller-size Universal Line selenium rectifiers you can take care of any serviceman's need. Whatever the make or rating, Federal has a *Universal* type—*or a Regular type*—to meet requirements.

The smaller "H" dimension of the Universal Line simplifies installations where space is a factor. These types are available in ratings of 65, 300, 350, 400 and 500 Ma.—and all five are of eyelet construction with 6/32" mounting screw enclosed. They are designed to handle approximately 70% of replacements.

Get all the rectifiers you'll ever need . . . from *one* source! Get assurance of *uniform* quality, dependability and performance—plus *long, long* life—by merchandising Federal's Universal and Regular Lines.

UNIVERSAL LINE RATINGS AND DIMENSIONS:

Type	Max. DC Ma.	"H" Dim. Max.	Plate Size
1263A	65	21/32"±1/32"	11/16" Sq.
1236A	300	1-3/8"±1/32"	1-5/8" Sq.
1238A	350	1-3/8"±1/32"	1-3/4" Sq.
1241A	400	1-1/4"±1/32"	2" Sq.
1237A	500	1-3/8"±1/32"	2" Sq.

Federal has available a new type bolt and nut for mounting rectifiers in tandem. Order bolts by Part No. IDR-6131; nuts by Part No. IDR-6015.

America's first and largest manufacturers of selenium rectifiers

FEDERAL PACKAGED POWER SELENIUM RECTIFIERS

Federal has America's largest stock of stacks for all popular applications . . . available through your nearest distributor. The packaged list shown below is but a fraction of Federal's designs available for meeting any a-c to d-c power conversion requirement.

VARIOUS APPLICATIONS

Model Railroads
Battery Chargers
DC Motor Supply—110 V
DC Relays and Solenoids
Home Electroplating
Home Telephone
DC Office and Machine Conversion
Electromagnets
DC Filament Power
DC Motor Speed Controls

Max. D.C. Output (Approximate)‡		Rectifier Stack Code Number	Max. A.C. Input Volts	Circuit and Stack Conn. Diagram	Rectifier Stack Dimensions				Catalog Number
Volts	Amps.				A	B ± 1/16"	C	Fig.	
10	3.0	106C1SAX1	13	'B'	3"	1 9/16"	2 1/32"	1	2100S
	6.0	133C1SAX1	13		4"	1 3/4"	1 7/32"	1	2101S
	12.0	136C1AX1	13		5" x 6"	1 3/4"		2	2102
20	3.0	106B1SAX1	26	'A'	3"	2 1/16"	2 1/32"	1	2103S
	6.0	133B1SAX1	26		4"	2 11/16"	1 7/32"	1	2104S
	12.0	136B1AX1	26		5" x 6"	2 3/4"		2	2105
40	3.0	106B2SAX1	52	'A'	3"	3 9/16"	2 1/32"	3	2026S
	6.0	133B2SAX1	52		4"	5"	1 7/32"	3	2107S
	12.0	136B2AX1	52		5" x 6"	5 1/4"		4	2108
60	3.0	106B3SAX1	78	'A'	3"	4 1/2"	2 1/32"	3	2118S
	6.0	133B3SAX1	78		4"	6 3/4"	1 7/32"	3	2033S
	12.0	136B3AX1	78		5" x 6"	7 5/16"		4	2085
80	3.0	106B4SAX1	104	'A'	3"	5 1/2"	2 1/32"	3	2109S
	6.0	133B4SAX1	104		4"	8 9/16"	1 7/32"	3	2110S
	12.0	136B4AX1	104		5" x 6"	9 5/16"		4	2111
100	1.0	139B5AX1	130	'A'	2" Sq.	5 3/8"		5	2112
	2.4	106B5SAX1	130		3"	6 5/8"	2 1/32"	3	2113S
	6.0	133B5SAX1	130		4"	10 9/16"	1 7/32"	3	2114S
120	0.3	103B6AX1	156	'A'	1 9/32" x 1 13/64"	4 3/4"		5*	2115
	0.6	104B6AX1	156		1 17/32" Sq.	4 7/8"		5	2036
	1.0	139B6AX1	156		2" Sq.	6 7/16"		5	2116
	2.4	106B6SAX1	156		3"	7 5/8"	2 1/32"	3	2038S
	6.0	133B6SAX1	156		4"	12 5/16"	1 7/32"	3	2117S

‡ Resistive or Inductive Loads
* 8-32 Thread

Note: Ratings for 35° C Ambient; Resistive or Inductive loads; all designs shown are for single phase full wave rectification.

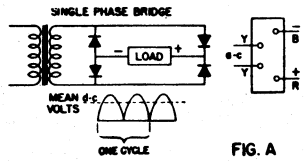


FIG. A

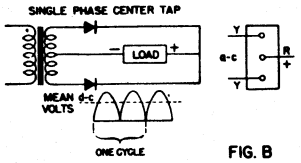


FIG. B

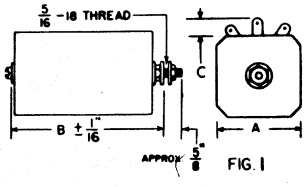


FIG. I

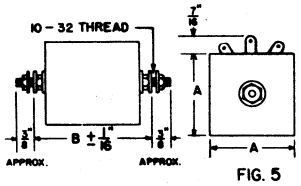


FIG. 5

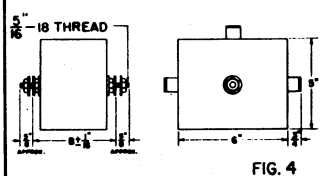


FIG. 4

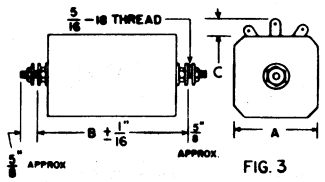


FIG. 3

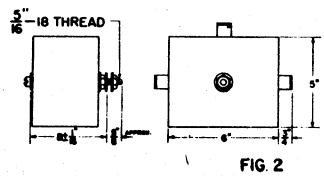
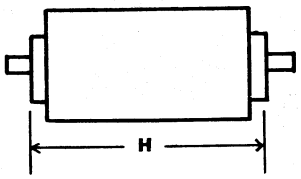
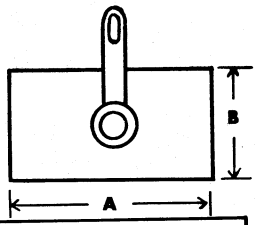


FIG. 2



SELENIUM RECTIFIER CROSS REFERENCE



Rectifier Code Number	Manufacturer	RMS Input Volts	MA, D-C	No. of Cells	Type of Assembly	Dimensions		
						'A'	'B'	'H'
1159	Federal	130	20	—	Paper Tube	1/2" diameter		3/4" long
8Y1	Radio Receptor			8	Eyelet	1/2"	1/2"	1/2"
1002A	Federal	130	65	6	Eyelet	1"	1"	9/16"
1263A	Federal			6	Eyelet	11/16"	11/16"	21/32"
65	Sarkes Tarzian			6	Eyelet	1"	1"	11/16"
8J1	Radio Receptor			8	Eyelet	11/16"	11/16"	1/2"
1003A	Federal	130	75	6	Eyelet	1"	1"	3/4"
75	Sarkes Tarzian			6	Eyelet	1"	1"	13/16"
5M4	Radio Receptor			5	Eyelet	1"	1"	11/16"
1004A	Federal	130	100	6	Eyelet	1 9/32"	1 13/64"	3/4"
1101A	Federal			6	Eyelet	1"	1"	1 1/8"
100	Sarkes Tarzian			6	Eyelet	1 1/4"	1 1/4"	13/16"
5M1	Radio Receptor			5	Eyelet	1"	1"	7/8"
1005A	Federal	130	150	6	Eyelet	1 9/32"	1 13/64"	1"
150	Sarkes Tarzian			6	Eyelet	1 1/4"	1 1/4"	1 11/64"
5P1	Radio Receptor			5	Eyelet	1 3/16"	1 3/16"	7/8"
6P2	Radio Receptor			6	Eyelet	1 3/16"	1 3/16"	1 3/16"
1006A	Federal	130	200	6	Eyelet	1 17/32"	1 17/32"	1"
200	Sarkes Tarzian			6	Eyelet	1 5/8"	1 5/8"	1"
5R1	Radio Receptor			5	Eyelet	1 1/2"	1 1/2"	7/8"
1010	Federal	130	250	6	Stud	1 17/32"	1 17/32"	1 1/4"
1028A	Federal			6	Eyelet	1 17/32"	1 17/32"	1 1/8"
250	Sarkes Tarzian			6	Eyelet	1 5/8"	1 5/8"	1 5/16"
5Q1	Radio Receptor			5	Eyelet	1 1/2"	1 1/2"	1 1/8"
6Q1	Radio Receptor			6	Eyelet	1 1/2"	1 1/2"	1 1/8"
6Q2	Radio Receptor			6	Eyelet	1 1/2"	1 1/2"	1 3/8"
1090A	Federal	130	300	6	Stud	1 17/32"	1 17/32"	2 7/32"
1236A	Federal			6	Eyelet	1 5/8"	1 5/8"	1 3/8"
300	Sarkes Tarzian			6	Eyelet	1 5/8"	1 5/8"	1 7/8"
6Q4	Radio Receptor			6	Stud	1 1/2"	1 1/2"	1 3/4"
1023A (1206)*	Federal	130	350	6	Stud	1 3/4"	1 3/4"	2 7/32"
1238A	Federal			6	Eyelet	1 3/4"	1 3/4"	1 3/8"
350	Sarkes Tarzian			6	Eyelet	2"	2"	1 5/16"
5QS1	Radio Receptor			5	Eyelet	1 1/2"	2"	1 1/8"
6QS2	Radio Receptor			6	Eyelet	2"	1 1/2"	1 3/8"
6QS4	Radio Receptor			6	Stud	2"	1 1/2"	1 3/4"
1130 (1056)*	Federal	130	400	6	Stud	2"	2"	1 1/4"
1241A	Federal			6	Eyelet	2"	2"	1 1/4"
400	Sarkes Tarzian			6	Eyelet	2"	2"	1 5/16"
1179A (1021)*	Federal	130	500	6	Stud	2"	2"	2 7/32"
1237A	Federal			6	Eyelet	2"	2"	1 3/8"
500	Sarkes Tarzian			6	Eyelet	2"	2"	1 7/8"
5S1	Radio Receptor			5	Eyelet	2"	2"	1 1/8"
1022	Federal	160	450/500	8	Stud	2"	2"	2 23/32"
6S1	Radio Receptor			6	Eyelet	2"	2"	1 1/8"
6S2	Radio Receptor			6	Eyelet	2"	2"	1 3/8"
1016	Federal	25	300	4	Eyelet	1 13/64"	1 9/32"	3/4"
304B	Sarkes Tarzian			4	Eyelet	1 1/4"	1 1/4"	11/16"
1017	Federal	25	600	4	Eyelet	1 17/32"	1 17/32"	3/4"
604B	Sarkes Tarzian			4	Eyelet	1.6"	1.6"	11/16"
1018	Federal	26	1800	4	Eyelet	4 1/4"	2 1/8"	5/8"
1013	Federal	18	450	1	Eyelet	1 17/32"	1 17/32"	1/4"
1001	Federal	20	75	1	Eyelet	1"	1"	3/8"
1M1	Radio Receptor			1	Eyelet	1"	1"	3/8"

*Code numbers in brackets are replaced by adjacent rectifier code numbers.

Servicing and Testing
FEDERAL SELENIUM RECTIFIERS

1. Testing the Selenium Rectifier

While the selenium rectifier has been found to be a long lived and trouble free component, instances do occur when it is important to know how to install them properly and test them when a radio or television set is in trouble. Faulty operation may result from the rectifier becoming open circuited, short circuited, high in forward resistance, or low in reverse resistance. If trouble occurs a visual inspection of the rectifiers and other components of the power supply may show whether replacement is necessary. As failure is not always accompanied by physical changes, an electrical test may be necessary to determine whether the rectifier is damaged.

2. Removal and Replacement

In soldering or unsoldering of leads to a selenium rectifier, the heated soldering iron should not be brought in contact with the cells making up the rectifier. The heat may melt the alloy on the cells or damage the protective coating.

The rectifier should be replaced in its original position, or in a position which provides better cooling. Best cooling is obtained when the rectifier is mounted with the cells vertical and when the passage of air through the cells is not restricted at the top or bottom.

When replacing a rectifier be sure that it is firmly fixed in place so that it cannot turn and come in contact with the chassis, other components, or wiring of the set. Any barriers provided by the set manufacturer for this purpose which have become damaged should be replaced.

The rectifier has been given a moisture resistant coating before leaving the factory. Additional coatings should not be applied unless it is first determined from the manufacturer that the coating to be used will not affect the rectifier.

Mercury vapor is very harmful to selenium rectifiers and wil destroy the rectifying action even though they have been coated. Any mercury remaining due to a broken mercury vapor tube should be carefully removed.

A line resistor is connected in series with the rectifier in radio and television sets. While omission of this resistor will increase the voltage of the B+ supply, it serves an important purpose in protecting the rectifier and condenser from heavy surge currents. These currents may damage or shorten the life of the rectifier and/or electrolytic condenser. In some sets the resistor rating has been selected so that it will burn out on overload, thus protecting more expensive components against burnout. Replacement of a burned line resistor should be made with another of the same type and rating.

A damaged rectifier may result from failure of the rectifier or faulty operation of the components of the set. When a selenium rectifier must be replaced, the current draw of the B+ circuit should be checked to be sure it is within the rating of the rectifier. The cabinet and chassis should be checked to be sure that ventilating openings have not been blocked off, or restricted, preventing proper cooling.

3. Visual Inspection

Trouble may be indicated by melting of the alloy which covers most of one side of each cell and which forms the cathodes of the rectifier. Such melting may be due to excessive temperature of the rectifier caused by current overload, or by restricted ventilation causing the temperature of the rectifier to rise above the melting point of the alloy. The melting may be indicated by a thickening of the alloy at the bottom edge of the cells or by the presence of drops of solderlike metal below the rectifier.

Inspection of the alloy area at the center of the cells around the contact washer may show burning or discoloration. A burning all around the contact washer may result in an open circuit and the rectifier should be replaced. Discolored or burned spots may be observed on the alloy away from the contact washer. These spots have been caused by sparking on the cells resulting from application of higher than rated voltage to the rectifier. They may also occur when voltage is first applied after a long period of idleness. These spots are self-healing and will not affect the operation of the rectifier unless an area equal to about 20 percent of a cell has been burned, or unless sparking is persistent. In either case the rectifier should be replaced.

4. Troubles Found in Selenium Rectifiers

The troubles found in selenium rectifiers will generally appear under one of the following classifications:

(a) Open circuited rectifier resulting in no B+ voltage.
(b) High forward resistance rectifier resulting in low B+ voltage.
(c) Short circuited rectifier resulting in burned out line resistor or opening of circuit protecting device.
(d) Low reverse resistance rectifier resulting in low B+ voltage and/or hum in loudspeaker of set.
(e) Overheated selenium rectifier resulting in melted alloy on the rectifier cells and any of the troubles listed above.

5. Ohmmeter Test

An ohmmeter of the conventional type employing a battery and meter for measuring resistance may be used for a rough check of a selenium rectifier.

Place the leads from the ohmmeter on the terminals of the rectifier in one direction and then reverse them, reading the resistance each time. Two high resistance readings will indicate an open circuited rectifier. Two low resistance readings will indicate a short circuited rectifier. One low and one high resistance reading will show that the rectifier is functioning as a rectifier. It will not, however, show whether the forward resistance is sufficiently low or the reverse resistance sufficiently high for satisfactory performance.

6. Forward Current Test

Figure 1 shows a simple circuit which can be made for testing the forward resistance of a selenium rectifier. The limits of forward current for each type of rectifier are shown in Table 1. These figures are approximate and give a good indication as to whether the rectifier is near the end of its useful life. There will be cases where rectifiers tested to these limits will not give high enough B+ voltage. Judgment must be used in marginal cases by testing the rectifier in the set and measuring the B+ voltage under actual working conditions. A rectifier which produces B+ voltage near the operating limit may cause trouble in the near future.

7. Reverse Current Test

Figure 2 shows a simple circuit which can be made for testing the reverse current of a selenium rectifier. When voltage is first applied to a good rectifier the reverse current will be high and will rapidly decrease while the voltage is applied. The short circuiting switch is used to protect the meter during the high current or forming period. Allow 1½ to 2 minutes for forming. It would be desirable to use a variable voltage transformer or a potentiometer (as shown) to increase the voltage gradually, protecting the tube in the event the rectifier has low reverse resistance.

TROUBLE SHOOTING CHART

Trouble	Possible Condition	Procedure
No B+ voltage.	Open line resistor. Open rectifier.	Test for AC voltage between switch and B—. If o.k.: Test for AC voltage between rectifier + and B—. If o.k. check stack for open circuit.
Low B+ voltage.	High forward resistance rectifier. Leaky or low capacity condenser. Excessive B + current.	Test rectifier for forward resistance. If o.k.: Test condenser for capacity and leakage. Test B+ circuit for excessive tube current or partial short circuit due to defective components.
Hum in Loudspeaker.	Leaky or low capacity condenser. Low reverse resistance rectifier.	Test condenser. If o.k.: test rectifier.
Sparking or dark spots on plates of rectifier.	Deformed rectifier.	If sparking occurs after set has been inoperative for a long time, leave it on as rectifier will probably reform. If sparking continues, test rectifier reverse resistance. If reverse current is high or sparking persists, replace rectifier.
Burned out line resistor.	Defective condenser. Defective rectifier. Shorted load.	Test for shorted rectifier or condenser. Check load for excess current or intermittent shorts.

TEST CIRCUITS

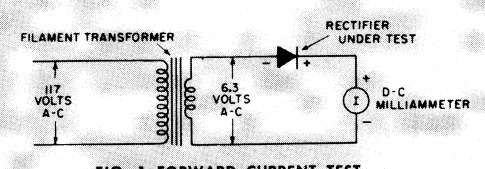


FIG. 1 FORWARD CURRENT TEST

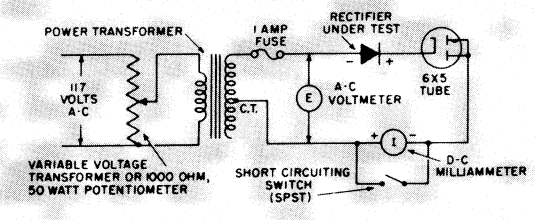


FIG. 2 REVERSE CURRENT TEST

Table I—TEST LIMITS for FEDERAL SELENIUM RECTIFIERS

Rectifier odel Number	Forward Current Test Minimum Milliamperes at 6.3 Volts A-C (See Fig. 1)	Reverse Current Test Maximum Milliamperes at E=240 Volts A-C (See Fig. 2)
1002A	20	13
1003	20	13
1004A	33	19
1005A	33	19
1006A	80	23
1007	11*	6*
1008	19*	8*
1009	43*	10*
1010	80	23
1014	19	8
1021	135	31
1022	65	13
1023	120	27
1028A	80	23
1090A	80	23
1101A	20	13
1159	6	4
1200	210	48
1263A	12	8
1223	210	48

*Test Limits Apply to a Single Section.

Fundamental Circuits Using
FEDERAL SELENIUM RECTIFIERS

Federal selenium rectifiers can be utilized in power supplies in virtually the same manner as the vacuum tube diode. For reasons that will be outlined subsequently, many circuits which were previously considered impractical, and hence rarely used, now have new significance and can be employed with great advantage. For example, voltage multiplier circuits which eliminate the need for power transformers in many applications, were practically non-existent in commercial sets heretofore, but have been widely used since the introduction of the selenium rectifier.

The characteristics of the selenium rectifier that have caused this re-evaluation of rectifier circuits are 1) no filament power required, 2) small size, 3) can be installed anywhere under the chassis and 4) larger RMS current capacity relative to its equivalent tube. It boils down to this: The selenium rectifier is as simple and economical to insert into an equipment design as a resistor or a condenser and, therefore, the use of an additional rectifier or two to achieve an improvement in performance is usually justified. This, of course, was not true when tubes were employed.

The well known half-wave rectifier circuit, shown in figure 1, is the simplest and most widely employed. The use of a selenium rectifier, rather than a tube, in this circuit permits the use of a higher capacity filter condenser—since the rectifier has a higher RMS current carrying capacity. By utilizing condensers of larger capacity, better regulation and higher d-c voltages can be obtained. To increase the life of all the components in this circuit, it is recommended that a peak current limiting resistor, which also can be selected to serve as a fuse in case of a short circuit, be inserted in series with the rectifier.

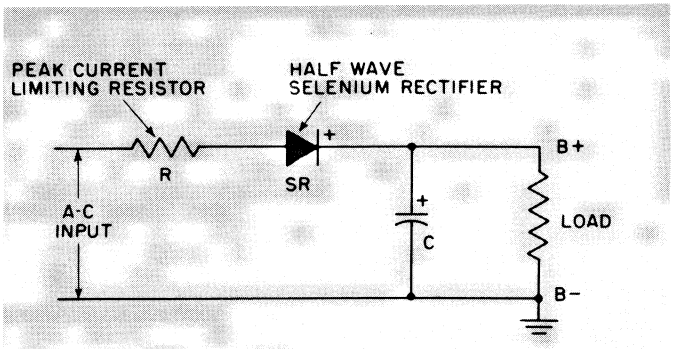


FIG. 1 HALF WAVE RECTIFIER CIRCUIT

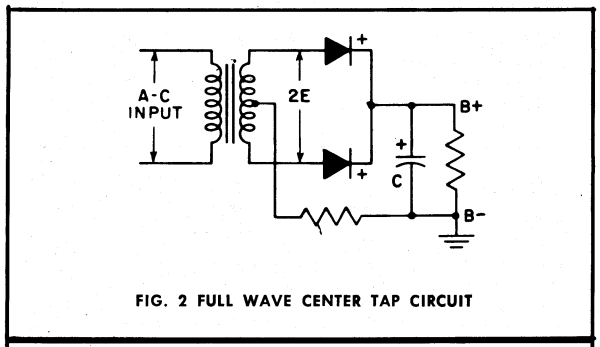


FIG. 2 FULL WAVE CENTER TAP CIRCUIT

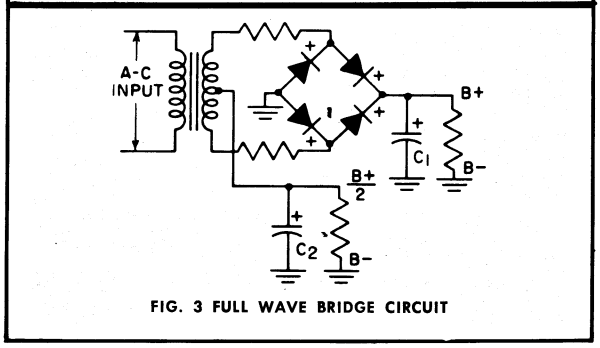


FIG. 3 FULL WAVE BRIDGE CIRCUIT

The half wave circuit, though very simple and economical, is also relatively inefficient and in applications where a higher degree of efficiency is necessary, the full wave center tap circuit shown in figure 2 or the full wave bridge rectifier shown in figure 3 can be employed. The bridge circuit requires four rectifying arms, but makes continuous use of the transformer. The center tap circuit uses only two rectifying arms but only one-half of the transformer secondary is in use during each half cycle. Therefore, the potential from either end of the transformer secondary winding to the center tap must be equal to the full transformer secondary voltage in the bridge circuit, to achieve the same DC output. As a result, with all other factors being equal, the transformer used in the center tap circuit requires a power rating 1.4 times greater than that used in the bridge circuit.

An additional advantage of the bridge circuit is that two voltages may be supplied from the same rectifiers. One is the full B+ voltage obtained from the output terminals of the bridge. The other is equal to one-half the B+ voltage and is obtained by using two arms of the bridge as a full wave center tap circuit (see fig. 3).

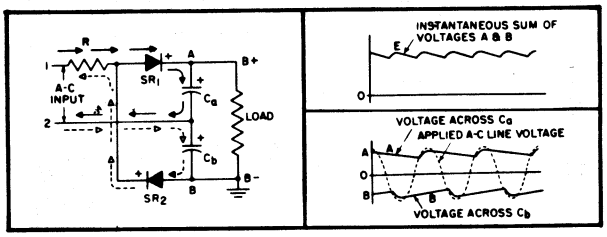


FIG. 4a FULL WAVE VOLTAGE DOUBLER CIRCUIT

FIG. 4b WAVE FORMS IN THE FULL WAVE DOUBLER CIRCUIT

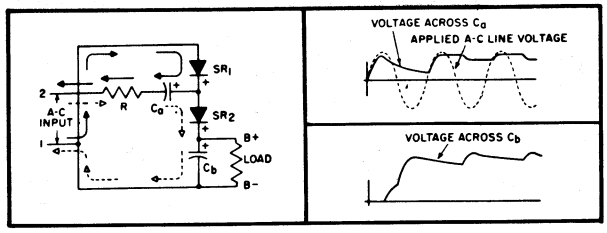


FIG. 5a HALF WAVE VOLTAGE DOUBLER CIRCUIT

FIG. 5b WAVE FORMS IN THE HALF WAVE DOUBLER CIRCUIT

VOLTAGE MULTIPLIER CIRCUITS

Where potentials exceeding the peak line voltage are desired, voltage multiplier circuits can be utilized to attain this potential without the use of heavy, expensive power transformers. Whereas there is no theoretical limit to the maximum voltage that can be obtained by this means, practical considerations limit their use to approximately three to four times the peak line voltage or about 500 volts for a 117 volt, 60 cycle input.

Two types of voltage doubler circuits are shown in figure 4 and 5. The one indicated in figure 4 is known as the full-wave doubler and operates in the following manner: When the line voltage polarity is such that point 1 is at positive potential with respect to point 2, a current will flow, as indicated by the solid arrows, through rectifier SR_1, thus charging condenser C_a so that point A is positive with respect to point 0.* During the next half cycle, when point 2 becomes positive with respect to point 1, SR_2 becomes conductive and condenser C_b charges negatively (as shown by the dotted arrows) with respect to point 0.* The potential difference between points A and B at the end of a full cycle (if the condenser did not discharge) would therefore be twice the peak line voltage. Actually, each condenser discharges during its negative half cycle, so that the cumulative wave-form is as shown in figure 4b.

The other type of voltage doubler circuit, known as the half-wave doubler, operates on a different principle. Assume that point 1 in figure 5a is positive with respect to point 2 during the initial half cycle. In this case charging current will flow in the direction shown by the solid arrows through rectifier SR_1, until Condenser C_a assumes a charge equal to the peak potential of the line. During the next half cycle, as point 2 becomes positive with respect to point 1, the charge of condenser C_a will add its potential to that of the line and current will flow through rectifier SR_2, as indicated by the dotted arrows, charging condenser C_b to a potential equal to that of the line plus that across condenser C_a. The voltage across C_b therefore is equal to twice the peak line voltage (if condenser C_a does not discharge). Condenser C_b recharges up only during one half of the cycle, and hence the resulting waveform of this circuit will be shown in figure 5b. It should be noted that with all other factors being equal, the half wave circuit provides poorer voltage regulation, and lower ripple frequency, than the full wave doubler.

*Fig. 4B

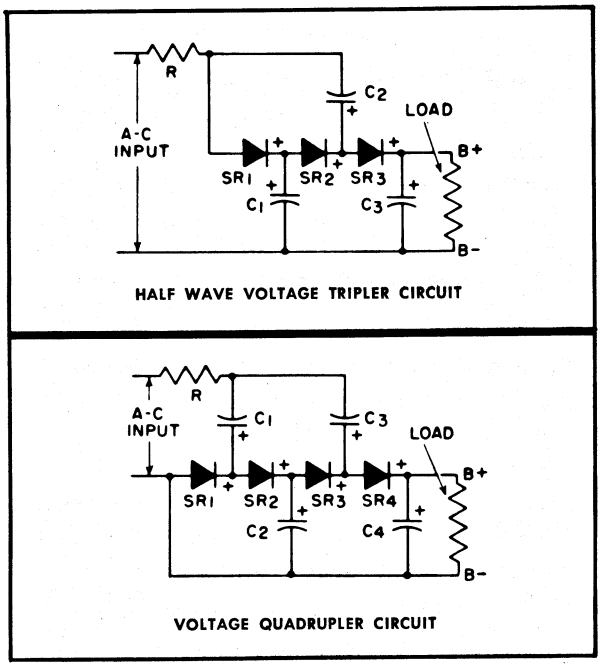
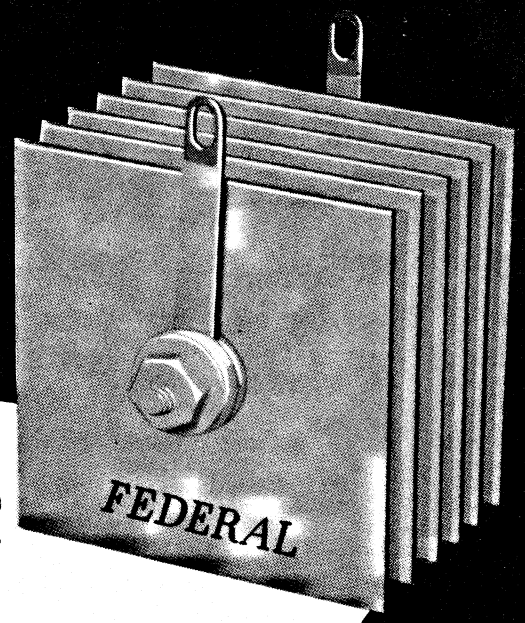


FIG. 6

The principle of the half wave doubler can be extended to higher order voltage multiplier circuits. That is, the voltage across C_b can be added on to a succeeding rectifier condenser circuit to provide triple peak line voltage output, and this latter condenser potential added to another circuit and so on until the desired degree of multiplication is attained. Figure 6 shows the schematic diagram of a voltage tripler and quadrupler circuit.

Federal

THE SELENIUM RECTIFIER WITH THE GREATEST



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More design and component engineers in the radio-TV industry have put their approval on Federal Selenium Rectifiers than any other make

And HERE'S why— point by point:

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HIGHER OUTPUT VOLTAGE...3 to 6½ higher B+ output volts than competitive selenium rectifiers in conventional doubler circuits.

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SUPERIOR HUMIDITY RESISTANCE... passes 1,000-hour life test in 95% relative humidity at 40° C.

PROVEN MECHANICAL CONSTRUCTION . . . brass eyelet or aluminum stud construction used exclusively. Patented "dead-center" construction allows stack to be tightened until rigid, without affecting the pressure-sensitive selenium characteristic.

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MORE UNIFORM QUALITY...Federal rectifiers are automatically 100% tested and inspected to meet standard forward and reverse current specifications, as well as for dielectric strength.

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For information about Federal Selenium Rectifiers —write Dept. PM-378

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