



# Techni-talk

## on AM, FM, TV Servicing

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### NEW GENERAL ELECTRIC GERMANIUM TV RECTIFIERS

Electric engineers as "unlimited" when the rectifier is properly designed and built.

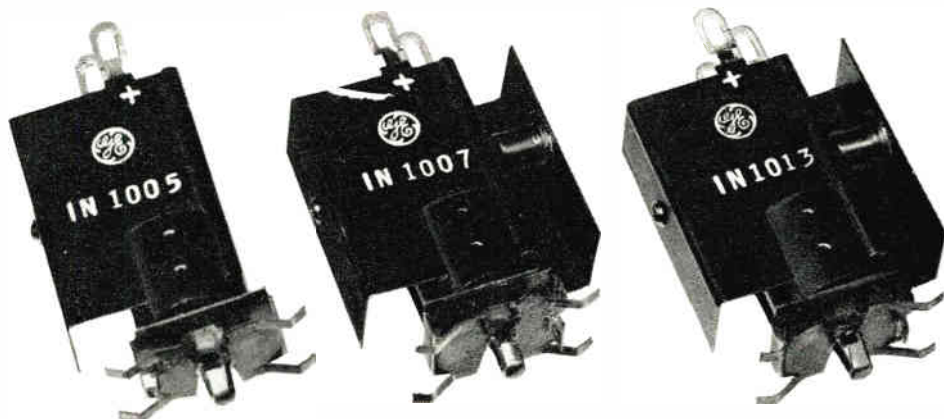


Fig. 1. The three General Electric germanium rectifiers now available for replacement purposes.

A new line of germanium rectifiers specifically designed for use in new model TV sets as well as for replacement of selenium rectifiers in older model receivers has been developed by the General Electric Company. These new rectifiers are compact, have an extremely long life, and are generally lower in cost than the selenium rectifier which they replace. In addition, they will mount in the same hole used for selenium rectifiers and without the use of a nut, lockwasher, or any other mounting hardware. Probably the most important advantage to the service technician is the significant increase in output voltage. At present there are the three replacement types shown in Fig. 1.

#### SMALL SIZE

The size of the General Electric germanium rectifier is considerably smaller than the selenium rectifier which it will replace. Fig. 2 shows a comparison in the size of a 400 ma selenium and a Type 1N1007 350 ma germanium rectifier. Fig. 3 shows two 300 ma selenium rectifiers and a 250 ma germanium doubler rectifier which could be used to replace both selenium rectifiers.

#### INCREASED OUTPUT VOLTAGE

The voltage regulation curves shown on page 5 indicate that a higher d-c output voltage is obtained from the germanium rectifier than from any other type of rectifier. This is due to the extremely low forward voltage drop (less than one-half volt) as shown in the rectifier ratings. The increase in output voltage is approxi-

mately fifteen volts for a single rectifier and as high as thirty or forty volts, depending on the load and capacitance for a voltage doubler. Comparable output voltages for various current loads with different load capacitors are shown in the voltage regulation curves. The increase in B+ voltage should improve any width or height problems which are either inherent in particular models or have developed due to aging of components or tubes.

#### LONG LIFE

The life of this new type rectifier is so long that it can be expected to outlast the life of the set. Unlike materials used in other rectifiers, germanium does not "age," wear out or burn out. Thus, the life expectancy of a rectifier made with germanium is characterized by General

#### LOW COST

The complete absence of aging effects in the germanium rectifier allows full rated performance over the entire rectifier life. Thus, if the receiver circuits require up to 250 ma, it is not necessary to use a higher rated rectifier in order to get longer life. It has been common practice, even by manufacturers, to use 350 or 400 ma selenium rectifiers in receivers which have a current drain of only 200 ma. Since the full rating of germanium rectifiers may be utilized, the cost of substituting these new type rectifiers is generally lower than replacement with higher rated seleniums.

Fig. 4 shows a General Electric chassis with the original selenium rectifiers in place. These two selenium rectifiers are listed in the service notes as a 350 ma type although the current drain when measured at 117 v line was only 200 ma. One Type 1N1013 germanium rectifier can therefore be used to replace both seleniums as shown in Fig. 5.

If a germanium rectifier is used as a replacement, the 250 ma Type 1N1005 (single) or 1N1013 (doubler) can be used in most TV receivers. If there is any doubt that the current drain is over 250 ma, it should be checked with a milliammeter. The suggested list price for the 250 ma Type 1N1005 is less than \$2.30 and for the 350 ma Type 1N1007 less than \$2.90. The 250 ma Type 1N1013 (doubler) is twice the price of the 1N1005.

#### EASY INSTALLATION

The new germanium rectifier can be mounted in the same hole as a selenium

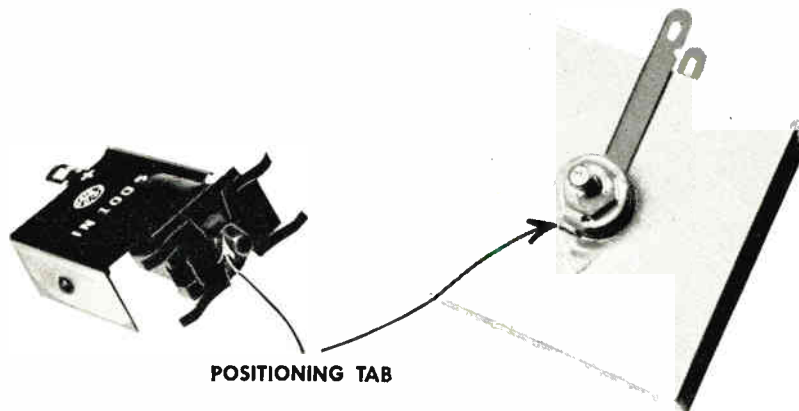


Fig. 2. Comparison in size of a 400 ma selenium rectifier with a Type 1N1007 350 ma germanium rectifier.

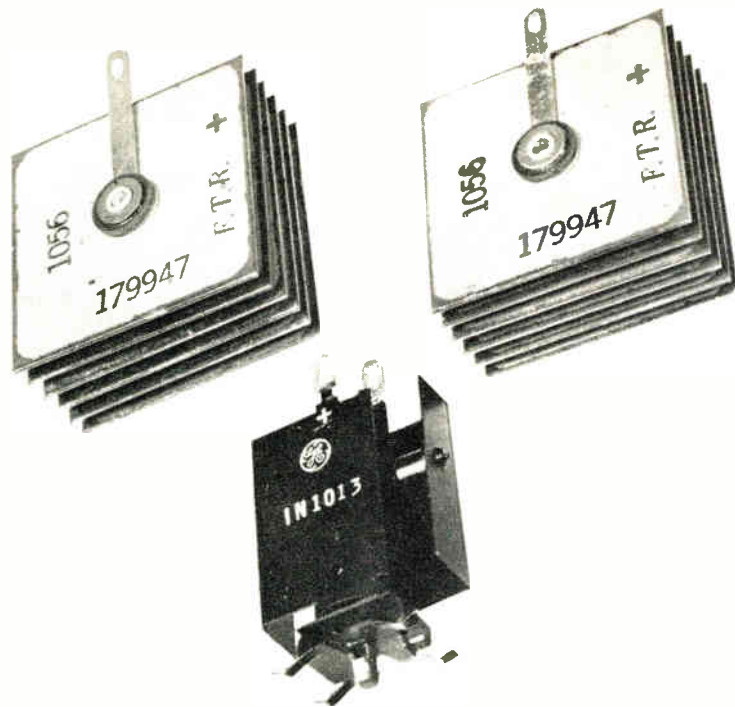


Fig. 3. Comparison in size of two selenium rectifiers with a voltage doubler Type 1N1013 germanium rectifier.

and in less time due to its mechanical "snap-in" design. This type of mounting will be recognized as similar to that used in mounting various TV coils such as the horizontal oscillator, width, linearity, etc. The appearance of a germanium rectifier mounted in the same hole used for one of the original selenium rectifiers can be seen in Fig. 5.

Since the original selenium rectifiers did not have the positioning tab shown in Fig. 2, it was only necessary to bend the tab so that it would be flat against the chassis. In most cases, the tab will break off as soon as it is bent and, therefore, will not present any mounting problem. Later model receivers usually have an additional hole for the positioning tab and this

will fit the tab on either the selenium or germanium rectifier.

Since either of the selenium mounting holes may be used, it should not be necessary to extend the original wires. It should also be noted that the wiring terminals are easily accessible, whereas selenium rectifier terminals are almost inaccessible after the rectifier is mounted. Some technicians have made a practice of mounting new selenium rectifiers to the side of the chassis because of wiring difficulties. This, of course, required drilling new holes plus extending the wires; it also presented a shock hazard. Replacement with the new General Electric germanium rectifier saves all the extra time and effort spent in mounting and wiring.

There are three other types of General Electric germanium rectifiers which are used in new model receivers. The only difference between the "equipment" types used by receiver manufacturers and the types used for replacement is in the mounting part of the rectifier. The "equipment" types require two mounting holes, whereas the replacement types only require one. The three "equipment" types 1N573, 1N575 and 1N581 have exactly the same price and ratings as the replacement types 1N1005, 1N1007 and 1N1013.

A rather complete replacement guide showing the type of germanium rectifier which can be used for replacement in several hundred different receivers appears on pages 3 and 4.

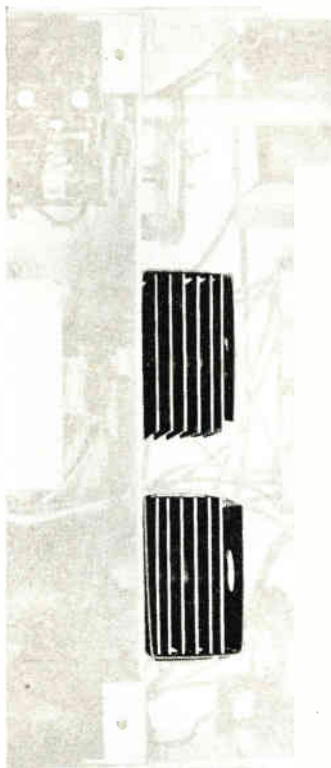


Fig. 4. A General Electric receiver with the original selenium rectifiers.



Fig. 5. A General Electric receiver with the two selenium rectifiers replaced by a single Type 1N1013 voltage doubler germanium rectifier.

# G-E GERMANIUM RECTIFIER REPLACEMENT GUIDE

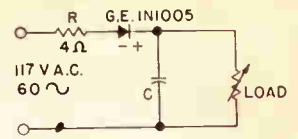
Mfrs. Model No.	Mfrs. Chassis No.	Mfrs. Part No.	Germanium Type No.	Mfrs. Model No.	Mfrs. Chassis No.	Mfrs. Part No.	Germanium Type No.
<b>ADMIRAL</b>							
T10 Series			1N1005	1106 Series	120255 Series	817033	1N1007
T18 Series	17 Series	93A2	1N1013	1107 Series	120269-L	817033	1N1007
TS10			1N1005	1108 Series	120257 Series	817019	1N1013
TS18	17 Series	93A2	1N1013	1109D	120258-D	817019	1N1013
				1110D	120257-D	817019	1N1013
				1111D	120258-D	817019	1N1013
				1112D	120257-D	817019	1N1013
				1113D	120258-D	817019	1N1013
35BR Series		21J20097	1N1013	1114 Series	120259 Series	817033	1N1007
45BR Series		21J20097	1N1013	1115D	120276-L	817033	1N1007
BR-3 Series		21J20097	1N1013	1116D	120257-D	817019	1N1013
BR-4 Series		21J23840	1N1013	1117D	120258-D	817019	1N1013
GSE-4 Series		C155575-2-1	1N1013	1118	120255-V	817033	1N1007
GSE-5 Series		57E16	1N1013	1118D	120255-P	817033	1N1007
GSL-4 Series		R-1422	1N1007	1119 Series	120269 Series	817033	1N1007
WG Series	21A59CT	66X14	1N1013	1120D	120257-D	817019	1N1013
				1121D	120258-D	817019	1N1013
21-55 Series	TE-382, TE-382-1	42383	1N1007 2 Req.	1122 Series	120263 Series	817019	1N1013
21-55 Series	TE-379, TE-379-1	42383	1N1007 2 Req.	1123D	120265-D	817019	1N1013
21-55 Series	"E" Series, TE-383 TE-386-UHF	42763	1N1005	1124	120286-P	817019	1N1013
				1124 Series	120263 Series	817019	1N1013
				1125	120287-T	817019	1N1013
				1125D	120265-D	817019	1N1013
				1126 Series	120257 Series	817019	1N1013
				1127	120258-D	817019	1N1013
K22 Series	T19	268619-1	1N1013	1127	120272 Series	817033	1N1007
T21 Series	T19	268619-1	1N1013	1128 Series	120273 Series	817033	1N1007
					120245 Series	817033	1N1007
					120256 Series	817033	1N1007
					120284-P	817019	1N1013
					120257 Series	817019	1N1013
					120258-D	817019	1N1013
					120257 Series	817019	1N1013
					120258-D	817019	1N1013
					120259 Series	817033	1N1007
					120276 Series	817033	1N1007
					120277-D	817019	1N1013
					120279-B	817019	1N1013
					120278-D	817019	1N1013
					120279-D	817019	1N1013
					120244-P	817033	1N1007
					120259 Series	817033	1N1007
					120276 Series	817033	1N1007
					120284-P	817019	1N1013
					120257 Series	817019	1N1013
					120285-T	817019	1N1013
					120258-D	817019	1N1013
					120284-P	817019	1N1013
					120257 Series	817019	1N1013
					120285-T	817019	1N1013
					120258-D	817019	1N1013
					120284-P	817019	1N1013
					120257 Series	817019	1N1013
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					120258-D	817019	1N1013
					120284-P	817019	1N1013
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					120258-D	817019	1N1013
					120284-P	817019	1N1013
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					120258-D	817019	1N1013
					120284-P	817019	1N1013
					120257 Series	817019	1N1013
					120285-T	817019	1N1013
					120258-D	817019	1N1013
					120284-P	817019	1N1013



Mfrs. Model No.	Mfrs. Chassis No.	Mfrs. Part No.	Germanium Type No.	Mfrs. Model No.	Mfrs. Chassis No.	Mfrs. Part No.	Germanium Type No.
<b>GENERAL ELECTRIC</b>							
10 Series		RER-004	1N1013	UC-2166	21J23840		1N1013
12 Series		RER-004	1N1013	UC-2185B, M	21T39	21J23840	1N1013
14C Series		RER-009	1N1013	UM-2130 Series	21T8	21J20097	(2) 1N1007
14T2, 3 Series		RER-009	1N1013	UM-2160 Series	21T19AGH	21J23840	1N1013
14T0 Series	"M" Line	RER-015	(2) 1N1007	UM-2165 Series	21T24AGH	21J23840	1N1013
14T0 Series	"Q" Line	RER-015	1N575	<b>RCA</b>			
16 Series		RER-009	1N1013	17-PT Series	KCS94 Series	100035	1N1013
17C Series		RER-008	1N1013	17-S Series	KCS93 Series	100035	1N1013
17C125, -UHF		RER-014	(2) 1N1007	21-CT-55	KCS94 Series	100035	1N1013
17T025, 6 Series		RER-019	1N581		CTC2B Series	78894	1N1013
17T2 thru 7 Series		RER-008	1N1013	21-S Series	CTC3A Series	78894	1N1013
17T10 thru 12-UHF		RER-008	(2) 1N1007		KCS93 Series	100035	1N1013
20C105, 6 Series		RER-008	(2) 1N1007	<b>SENTINEL</b>			
20C107 Series		RER-014	(2) 1N1007	29 Series		C-155575-2-1	1N1013
21C200 Series		RER-008	(2) 1N1007	210 Series		C-155575-2-1	1N1013
21C201 Series		RER-014	(2) 1N1007	211 Series		57E16	1N1013
21T1 thru 6-UHF		RER-014	(2) 1N1007	IU-900 Series		C-155575-2-1	1N1013
		RER-008	(2) 1N1007	IU-1000 Series		C-155575-2-1	1N1013
		RER-008	1N1013	IU-1100 Series		57E16	1N1013
800 Series		RER-004	1N1013	IU-2100 Series		57E16	1N1013
<b>HALLICRAFTERS</b>							
17 Series	16 Series	27A173	1N1013	17 Series	250 Series	ESR-100	1N1013
	20 Series	27A218	1N1007	21 Series	250 Series	ESR-100	1N1013
21 Series	16 Series	27A173-B	1N1013	<b>SILVERTONE</b>			
	17 Series	27A173	1N1013	4100 Series	528 Series	T80-829	1N1013
	18 Series	27A218	1N1013			83-829	1N1013
		27A218-A	1N1013	5100 Series	528 Series	T80-829	1N1013
	19 Series	27A218	1N1013			83-829	1N1013
	20 Series	27A218-B	1N1013		549 Series	27A173	1N1013
24 Series	18 Series	27A218	1N1013			27A173-B	1N1013
		27A218-A	1N1013			27A218	1N1013
	19 Series	27A218	1N1013	6100 Series	528 Series	83-829	1N1013
	20 Series	27A218	1N1013			83-880	(2) 1N1007
		27A218-B	1N1013	PC-41 Series	456 Series	T80-829	1N1013
			1N1013			83-829	1N1013
			1N1013	PC-51 Series	456 Series	T80-829	1N1013
			1N1013			83-829	1N1013
			1N1013	PC-52 Series	456 Series	T80-829	1N1013
<b>MAJESTIC</b>							
40 Series	125 Series	C-39, 207	1N1013	<b>SONORA</b>			
50 Series	126 Series	C-39, 207	1N1013	565, 576, 605, and 613			(2) 1N1005
<b>METEOR</b>							
41 Series	45 Series	83-829	1N1013	<b>SPARTAN</b>			
41 Series	528, 34000 Series	83-829	1N1013	21 Series	15 Series	PA-4224	1N1013
41 Series	528, 37000 Series	83-829	(2) 1N1007		16 Series	PA-4224	1N1013
41 Series	528, 45000 Series	83-829	1N1013	<b>SYLVANIA</b>			
<b>MOTOROLA</b>							
17K Series	40 Series	48B700555	1N1013	21C400 Series	1-532 Series	517-0010	(2) 1N1007
17T Series	41 Series	48B700555	1N1013	21C400 "U" Series	1-526-6	517-0009	1N1013
	42 Series	48B700555	1N1013	21T100 Series	1-532 Series	517-0010	(2) 1N1007
21C Series	50 Series	48B700555	1N1013	21T100 Series	1-526 Series	517-009	1N1013
21F Series	50 Series	48B700555	1N1013	511 Series	1-527 Series	517-009	1N1013
21K Series	50 Series	48B700555	1N1013	610 Series	1-526 Series	517-009	1N1013
	51 Series	48B700555	1N1013	620 Series	1-526 Series	517-009	1N1013
	52 Series	48B700555	1N1013	<b>TRAV-LER</b>			
	53 Series	48K120023	1N1013	510 Series	520C5	TV-SR-5	1N1007
		48K122454	1N1013	520 Series	520C5	TV-SR-5	1N1007
21T Series	50 Series	48B700555	1N1013	<b>TRUETONE</b>			
	51 Series	48B700555	1N1013	2D152 Series	21T31	21J25315	(2) 1N1007
	52 Series	48B700555	1N1013		21T33	21J25315	(2) 1N1007
	53 Series	48K122454	1N1013	2D153 Series		66X14	1N1013
24T Series	60 Series	48K720023	1N1013	2D1633A		66X14	1N1013
Y-17 Series	40 Series	48B700555	1N1013	2D24 Series		21J23840	1N1013
	41 Series	48B700555	1N1013	2D25 Series	21T31	21J25315	(2) 1N1007
Y-21 Series	50 Series	48B700555	1N1013		21T33	21J25315	(2) 1N1007
	51 Series	48B700555	1N1013			66X14	1N1013
	52 Series	48B700555	1N1013	<b>WELLS GARDNER</b>			
	53 Series	48K122454	1N1013	232 Series		66X14	1N1013
		48K120023	1N1013	321 Series		66X14	1N1013
Y-24 Series	60 Series	48K720023	1N1013	324 Series		66X14	1N1013
<b>MUNTZ</b>							
42 Series	47 Series	PR-0231	1N1005	<b>WESTINGHOUSE</b>			
52 Series	47 Series	PR-0231	1N1005	H-24 Series	V-23 Series	V-15920-1	(2) 1N1007
72 Series		PR-0231	1N1007	H-89 Series	V-23 Series	V-14392-1	(2) 1N1007
<b>OLYMPIC</b>							
14 Series	AD Series	RF-3613	(2) 1N1005	H-90 Series	V-23 Series	V-14392-1	(2) 1N1007
17 Series	AE Series	RF-3613	(2) 1N1005	H-91 Series	V-23 Series	V-14392-1	(2) 1N1007
<b>PHILCO</b>							
20 Series	7E10 Series		1N1007	H-92 Series	V-23 Series	V-15920-1	1N1013
	7E11 Series		1N1007			V-14392-1	(2) 1N1007
			1N1013	H-93 Series	V-23 Series	V-15920-1	(2) 1N1007
M-17 Series	17-T Series	21J23840	1N1013	H-94 Series	V-23 Series	V-15920-1	(2) 1N1007
C-213 Series	21T11	21J22274	(2) 1N1007	H-95 Series	V-23 Series	V-15920-1	(2) 1N1007
C-216 Series	21T21 Series	21J23840	1N1013	H-96 Series	V-23 Series	V-14392-1	(2) 1N1007
M-21 Series	21T24 Series	21J23840	1N1013			V-15920-1	1N1013
M-21 Series	21T193C	21J23840	1N1013	H-97 Series	V-23 Series	V-15920-1	1N1013
UC-21 Series	21T8	21J20097	(2) 1N1007	H-98 Series	V-23 Series	V-15920-1	1N1013
UC-2163	21T27AGH	21J23840	1N1013	<b>ZENITH</b>			
UC-2164	21T20AGH	21J23840	1N1013	T-18 Series	16T-Series	212-14	1N1013
			1N1013	X-18 Series	16X-Series	212-14	1N1013

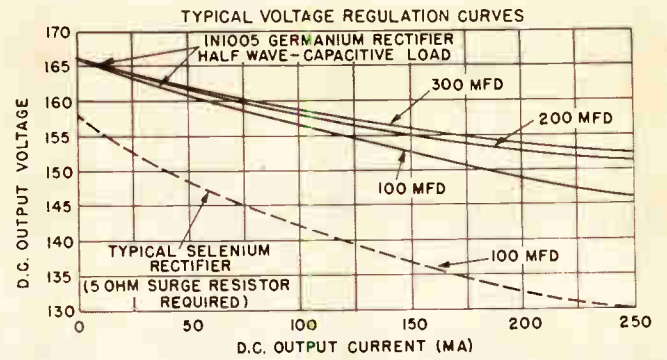
# 1N1005

The Type 1N1005 has a rating of 250 ma and may be used either as a half wave rectifier or with a second 1N1005 as a voltage doubler. If two 1N1005 rectifiers are to be used, it would be easier to use one 1N1013 since it is composed of two 1N1005 units already wired for voltage doubler applications. The ratings, typical voltage regulation curves, and a half wave circuit are shown for the 1N1005.



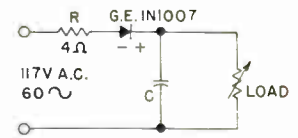
	Recommended Design Center	Absolute Maximum
RMS Input Voltage	117	130 volts
Peak Inverse Voltage	310	380 volts
D-C Output Current	150-250	250 ma
Rectifier Full Load Voltage Drop*	0.12	0.15 volts
Series Surge Resistor	4	4 (min) ohms
Load Capacitor	100-300	300 $\mu$ f
Ambient Operating Temperature	40	55 °C
Operating Fin Temperature	50	65 °C

\*Full Cycle Average.



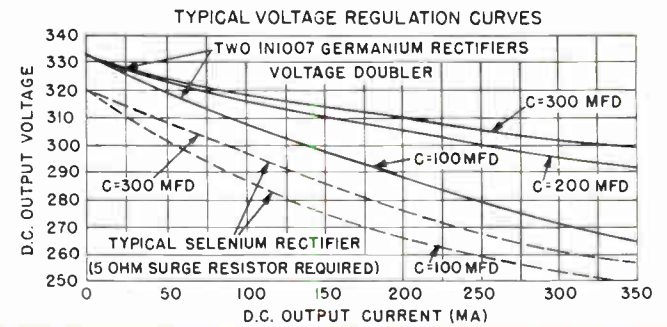
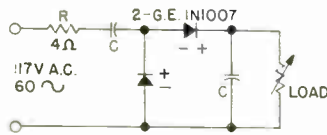
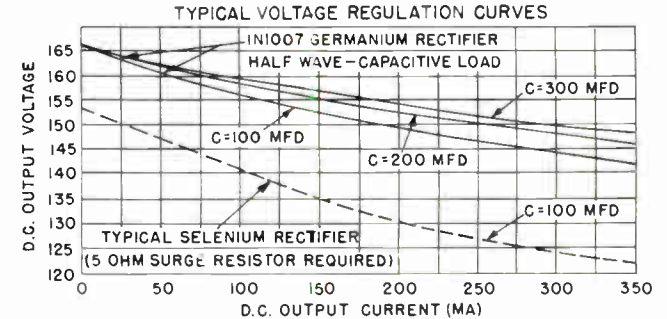
# 1N1007

The Type 1N1007 has a rating of 350 ma and may be used as a half wave rectifier. It may also be used with a second 1N1007 as a voltage doubler. Ratings, voltage regulation curves, and both half wave and voltage doubler circuits are shown.



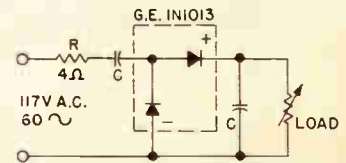
	Recommended Design Center	Absolute Maximum
RMS Input Voltage	117	130 volts
Peak Inverse Voltage	310	380 volts
D-C Output Current	200-350	350 ma
Rectifier Full Load Voltage Drop*	0.28	0.30 volts
Series Surge Resistor	4	4 (min) ohms
Load Capacitor	100-300	300 $\mu$ f
Ambient Operating Temperature	40	55 °C
Operating Fin Temperature	50	65 °C

\*Full Cycle Average.



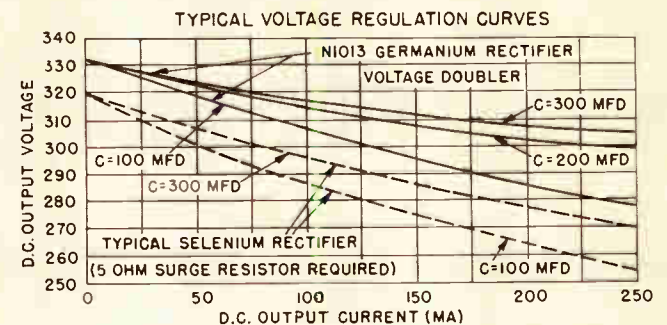
# 1N1013

The Type 1N1013 consists of two germanium rectifiers connected in a voltage doubler configuration with a rating of 250 ma. Ratings, voltage regulation curves, and a voltage doubler circuit are shown. Since only the plus terminal is marked, the middle terminal is negative and the other side is the input terminal.



	Recommended Design Center	Absolute Maximum
RMS Input Voltage	117	130 volts
Peak Inverse Voltage	310	380 volts
D-C Output Current	150-250	250 ma
Rectifier Full Load Voltage Drop* (each section)	0.12	0.15 volts
Series Surge Resistor	4	4 (min) ohms
Load Capacitor	100-300	300 $\mu$ f
Ambient Operating Temperature	40	55 °C
Operating Fin Temperature	50	65 °C

\*Full Cycle Average.



# BENCH NOTES

Contributions to this column are solicited. For each question, short-cut or chronic-trouble note selected for publication, you will receive \$10.00 worth of electronic tubes. In the event of duplicate or similar items, selection will be made by the editor and his decision will be final. The Company shall have the right without obligation beyond the above to publish and use any suggestion submitted to this column. Send contributions to The Editor, Techni-talk, Tube Department, General Electric Company, Schenectady 5, New York.

## PIX TUBE DUST SEAL

There are many thousands of the old 16-in. round metal picture tube RCA sets still to be serviced and every serviceman knows that it's a major project to clean the glass and picture tube. Everything has to be removed from the cabinet to accomplish this cleaning job, and to be thorough, it is sometimes necessary to also remove the mask frame.

Now here is my suggestion: After cleaning and before putting the picture tube back, remove all the old rubber dust seal which is stuck on the mask under the holder clips. Then replace the picture tube and fill in the space around the rim of the picture tube with caulking cotton, which is used for filling cracks around window or door frames and also for boat caulking. This cotton comes in bundles, very inexpensive, and can be obtained in most large hardware stores or boat dealers.

Once this is done, the serviceman does not have to groan when he gets a call back six months or so later, because that glass and picture tube will still be clean when he gets there and will stay clean even after a year.

Joseph T. Koval  
225 N. Patterson Pk. Ave.  
Baltimore 31, Maryland

## HORIZONTAL FOLDOVER

### Motorola 12VK11-TS 23A

This concerns foldover in center of a picture with short width. Check screen resistor of 6BQ6-GT and you will usually find that the 6800-ohm resistor has increased to a very large value.

Sal Polichetti  
Air-Wave Service  
2268 Bath Ave.  
Brooklyn, N. Y.

## ION TRAP ADJUSTMENT

Often in servicing a TV receiver the ion-trap position for optimum brightness and focus might be questionable, and the ion trap itself difficult to position due to a tight spring or other obvious reasons.

To save time and minimize frustrations in positioning the ion trap correctly, I use an alnico magnet from a discarded speaker. By rotating the magnet near the ion trap, I can tell whether the ion trap needs adjustment and can position it correctly for optimum brightness on the picture tube in a matter of seconds.

Jerome Sit  
Electronic Radio & TV Workshop  
103 Highway No. 1, South  
Greenville, Mississippi

## MINIATURE NEEDLE-NOSE PLIERS

I would like to pass on a handy bit of information in the form of a tool which has been of great service to me. It is an instrument used by every surgeon in every hospital in the country. It is called a mosquito hemostat. It is smaller than the smallest needle-nose pliers and has the added advantage of being able to be locked closed. Any serviceman that has had to handle a very small wire deep in a wire-tangled chassis can see the distinct advantage of this instrument. A varied assortment of sizes are available for use in almost every situation. I recommend a set of one Mosquito, one straight 6-in. Kelly hemostat and a curved Kelly hemostat. Instruments are available at any medical supply house or in a used condition at almost any hospital or doctor's office.

James E. Fabris  
2724 N. Buttrick St.  
Waukegan, Illinois

## BORROWED HV

When there is no raster present on the set under repair, e.g., there is no H.V. available, I usually "borrow" the H.V. from another set. I connect both chassis (on transformerless sets observe polarity) and the anode cap to the CRT under test. With a raster on the screen I can tell by the width if the oscillator or damper circuit is defective. This shortcut has helped me many a time.

Hugo Goldberger  
3839 Boardman Ave.  
Baltimore 15, Md.

What's new!

## 25EC6

### BEAM PENTODE

The 25EC6 is a beam-power pentode designed for use as the horizontal-deflection amplifier in television receivers that employ 110-degree-deflection picture tubes. Designed especially for use in receivers that operate from off-the-line rectifiers, the tube features high performance capabilities at relatively low supply voltages. In addition, the 25EC6 features a controlled heater warm-up characteristic to make it especially suited for use in television receivers that employ 600-milliamper series-connected heaters.

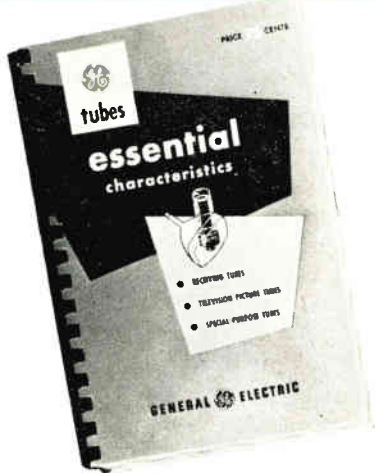
Heater Voltage, AC or DC.....25 Volts  
Heater Current.....0.6 ± 6% Amperes  
Heater Warm-up Time.....11 Seconds



## CHARACTERISTICS AND TYPICAL OPERATION

### AVERAGE CHARACTERISTICS

Plate Voltage.....135 Volts  
Screen Voltage.....135 Volts  
Grid-Number 1 Voltage.....-22.5 Volts  
Plate Resistance, approx.....4700 Ohms  
Transconductance.....7500 Micromhos  
Plate Current......70 Milliamperes  
Screen Current.....4.5 Milliamperes  
Grid-Number 1 Voltage, approx.  
 $I_b = 1.0$  Milliampere.....-42 Volts



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R. G. KEMPTON, Editor

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