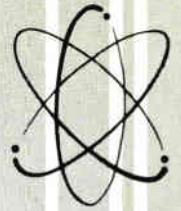




# Techni-talk

COMPLETE ELECTRONIC SERVICING INFORMATION  
radio • tv • hi-fi



Vol. 18, No. 2

Summer, 1966

## G-E Porta-Color Television Picture Tube

In the previous issue the electron gun structure, aperture mask, dot structure and beam travel was described. In this issue the convergence assembly and convergence adjustments will be discussed.

Although purity achieves illumination of each of the three color phosphor dots by the proper electron gun, this does not necessarily mean that all three beams are converged.

For the 11SP22 picture tube the green gun may be viewed as a reference for convergence since the gun is in the center of the gun cluster.

A cylindrical metal shield is provided on the end of the green gun structure to reduce the effects of the magnetic field applied to each of the

outside guns by the convergence assembly, see Figure 1. This figure also illustrates the magnetic coupling of the external convergence assembly on each of the outside guns. Construction of the assembly is shown in Figure 2 and 3.

The convergence assembly is made up of two vertical and two horizontal magnet assemblies mounted on an elongated piece of plastic. This complete assembly is mounted on the neck of the picture tube 1½ inches from the socket end of the tube as shown in Figure 4. This places the vertical correction magnets over the "C" shaped pole pieces on the red and blue guns and the horizontal magnets over the "L" shaped pole pieces at the very front of the gun structure.

Each vertical magnet assembly has several turns of wire on the inside leg of an "E" shaped core and, with the coil connected in series with the vertical deflection coils, a magnetic field is produced in this arm of the core. The field thus produced is coupled from this arm of the core thru a movable permanent magnet to the "U" shaped portion of the core where the direction of the field disperses to both ends of the core. From here the field is coupled thru the glass envelope of the tube to the pole pieces of the red or blue gun resulting in a vertical deflection of the beam as shown. Since the permanent magnet is magnetized as

*Continued to page 7*

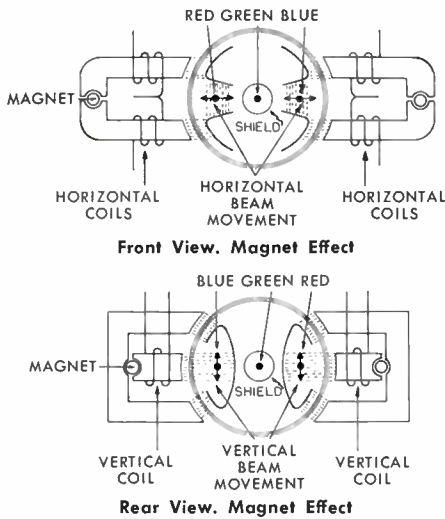


Fig. 1. Convergence Magnetic Coupling

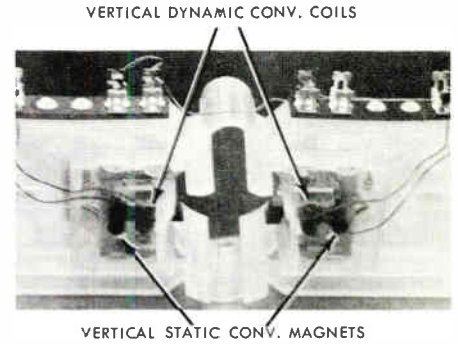


Fig. 2. Convergence Assembly Rear View

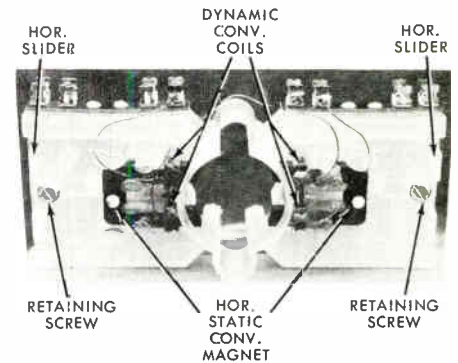


Fig. 3. Convergence Assembly Front View

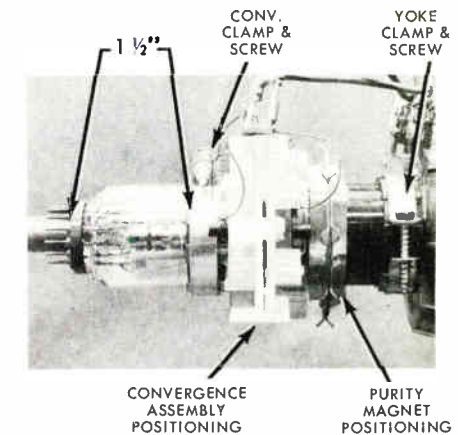
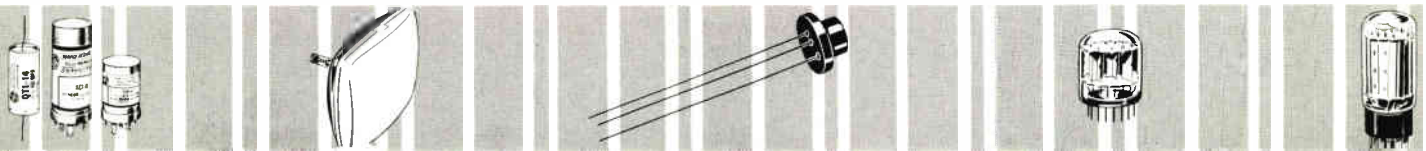


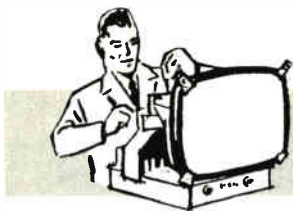
Fig. 4. Convergence Assembly Positioning

### "GALAXY OF GIFTS"

General Electric's big new "Galaxy of Gifts" program is now in full swing at your participating G-E Tube Distributor.\* A variety of useful gifts are available with the purchase of General Electric tubes. See pages four and five in this issue and ask your G-E tube distributor for a copy of the "Galaxy of Gifts" brochure which will give you complete details including pictures of the available gifts.

\*\*"Galaxy of Gifts" participation is available at the option of your local G-E Distributor.





## BENCH NOTES

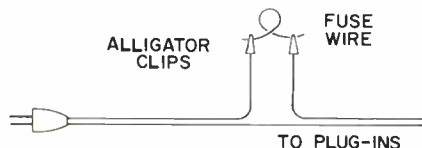
### USE FOR OLD BATTERIES

Most dry cell batteries which have developed too high an internal resistance to deliver sufficient current and voltage to the units they were operating may still be of use to the experimenter, builder, etc. Particularly in cases, requiring voltage only (or extremely low currents) these discarded batteries may be completely satisfactory. Examples are: bias voltages for applications wherein no grid current is drawn; deflection potentials for electron ray tubes (6E5, 6U5, etc.). A high resistance potentiometer connected across the battery in the conventional voltage divider circuit can provide the needed voltage pickoff points.

*A. W. Edwards  
456 Glenmore St.  
Corpus Christi, Texas 78412*

### QUICK FUSE REPLACEMENT

We're forever getting in TV and radio sets which have developed a short circuit, so plugging them in for tests blows our fuses out which means a hasty trip to the basement to replace the fuse. To prevent this annoyance our row of plug-in outlets at the test bench has one line cut in two, with each end soldered to a 'gator clip across which we tie a piece of fuse wire of an amperage less than our panel fuse in the basement.



Should a short blow the piece of wire, it only takes a moment to bridge the two clips with another piece off our roll of 3-amp fuse wire, which can be doubled back and forth to beef it to 6, 9 or 12 amps.

Saves time and fuses.

*H. Josephs  
Box 22  
Gardenville, Pa. 18926*

### LOOSE SOCKET CONNECTIONS

Loose pins in compactron type tube sockets can be difficult to locate. Wiggling the tube in the socket and noting an intermittent condition convinces the serviceman that trouble is apparent. Determining the intermittently connected pin can be more difficult. I use the wire end of an Allen-Bradley type two watt resistor as a pin gauge. The wire is slightly larger than that of a compactron pin. Sliding the wire into the individual pin connectors will readily determine the loose one. The tight pin connectors exhibit a "grabbing" effect on the wire. The loose one or ones are thus quite evident.

*Wm. Shaunnessey  
R. Cooper, Jr., Inc.  
836 So. Canal St.  
Chicago, Ill. 60607*

### WEAK ANTENNA

In many of the small transistor radios I have worked on, I noticed the antenna loop is very weak. One way to bring up the pulling power of the stations and the volume is to place one or two pennies near the loop antenna.

*Walter Bylka  
721 Columbia St.  
Utica, N. Y. 13502*

### MEASURING ELECTROLYTIC CAPACITORS IN CIRCUIT

Electrolytic capacitors, whether used as by-pass or filter, may be measured for capacity without disconnecting them from the circuit. Contrary to popular belief, the usual Resistance-Capacitance Bridge such as made by Heathkit, Eico or Paco, will measure these electrolytics even when shunted by low values of resistance.

With the bridge leads connected across the capacitor, the balance control is adjusted along with the power-factor control, for maximum opening of the "eye". The power-factor control compensates for the circuit resistance, and its setting is not used to figure the capacity in this case. One word of caution; the low voltage electrolytics, such as found in transistor radios, should not be checked with this type of capacity bridge, due to the approx. 55v. a-c bridge voltage.

*Bob Brettell  
17600 N. E. 7th Ct.  
N. Miami Beach, Fla. 33162*

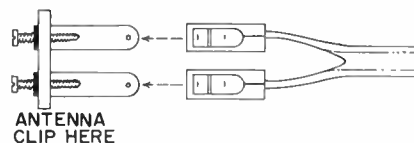
### GUN TIP REPLACEMENT

Should you be caught without a spare tip to replace one on your soldering gun, bare a piece of #12 copper wire; use the broken tip as a pattern; bend it to shape and cut to size.

*Henry Mullen  
919 1/2 Manor Ave.  
Cleveland, Ohio 44104*

### ANTENNA CONNECTOR

We think we have a better idea for in-shop antenna connection adaptors (for Philco, Admiral and the like) than that proposed in the Fall and Winter issue of Techni-Talk.



We use the two terminal screw connector strips (GC No. 1772, or equivalent) as they make a more convenient connector when the clothespin type clip is used on the end of the lead-in in the shop.

*W. T. Lloyd Davies  
City Radio & TV Service Co.  
212 S. Second St.  
Aberdeen, S. Dakota*



### SERVICE TOOL

I have found that a 1/4" ratchet drive socket set with several extensions and a universal joint make an excellent tool for use in electronic servicing. Although it is primarily an automotive tool it is perfect for going around corners and reaching screws and nuts that an ordinary spintite would never reach.

*John Thorup  
CB Associates  
61 E. Crescent Dr.  
San Rafael, Calif.*

### COLOR BAND RESTORATION

In the absence of a schematic and when it is necessary to know the values of resistors that are faded, greasy, etc., rubbing with some speaker service solvent will often restore color band brightness for easy identification.

*Harry J. Miller  
991 - 42nd St.  
Sarasota, Fla.*

### ODOR REMOVAL

When a TV, stereo, etc. has been on fire, get rid of obnoxious smell of flame and smoke by slicing a few oranges and placing them inside the closed cabinet. If set's enclosure is open, cover it with a piece of sheet plastic.

Within 12 to 24 hours, the citrus will absorb every trace of objectionable odor.

*S. Clark  
Box 2162  
East Bradenton, Fla.*

### A HANDY HEAT SINK

A handy heat sink can be made from a small piece of aluminum foil about two inches long and a 1/4 of an inch wide. It is then placed around the heat sensitive component's lead in the form of a little wing.

This kind of a heat sink is very handy when there is not much room and/or when there is a danger of a larger one shorting out.

*Jim Stewart  
Stewart Electronics  
313 West Fourth St.  
Cle Elum, Wash.*

### NOTE:

Those desiring to have letters published in this column should write the Editor Techni-Talk, Electronic Components Division, General Electric Company, Owensboro, Kentucky. For each such letter selected for publication you will receive \$10.00 worth of General Electric 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 unlimited right without obligation to publish or otherwise use any idea or suggestion sent to this column. Caution: The ideas and suggestions expressed in this column are those of the individual writers. These ideas and suggestions have not been tried by the General Electric Company and therefore are not endorsed, sponsored or recommended.

# RECEIVING TUBE POPULARITY LISTING

Listed below are the 214 most popular tube types based on distributor usage. One list is in order by usage and the other by alpha-numerical sequence. The

figure following each tube type indicates popularity. Number 1, 5U4GB had the highest volume; Number 2, 6DQ6B was next, etc.

## LISTING BY VOLUME

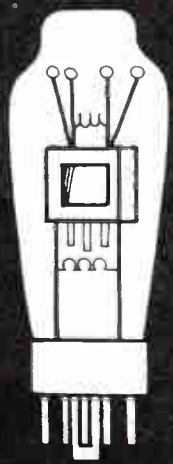
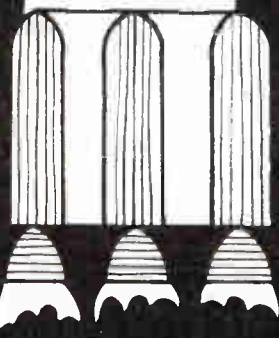
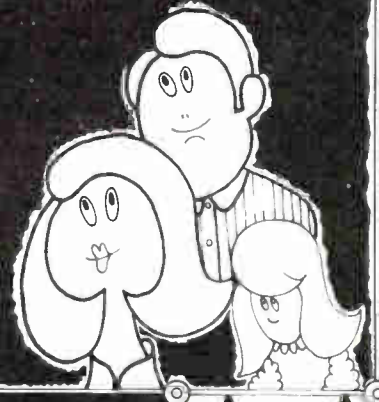
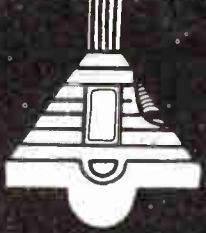
5U4GB	1	12AV6	37	6CL8A	73	6EM5	109	6AF3	145	19AU4GTA	181
6DQ6B	2	6BZ7	38	6JE6	74	8FQ7	110	6AX3	146	25CD6GB	182
6CB6A	3	6CM7	39	1K3/1J3	75	25L6GT	111	6BS8	147	3BN6	183
6AX4GTB	4	5Y3GT	40	5CG8	76	50EH5	112	6SJ7	148	5BR8	184
50C5	5	1X2A/1X2B	41	6AS5	77	6BL8	113	12CA5	149	5T8	185
6U8A	6	3A3/3AW3	42	6CU5	78	6CX8	114	17D4A	150	6AG5	186
6BQ7A	7	6CD6GA	43	6W6GT	79	6DA4A	115	6AK6	151	6BA8A	187
12AU7A	8	5U8	44	6AU8A	80	6GY6	116	6BN8	152	6CF6	188
6SN7GTB	9	6BK7B	45	6AY3	81	7AU7	117	6B10	153	6CU8	189
35W4	10	6V6GTA	46	6BC8	82	8AW8A	118	6CE5/6BC5	154	6CW4	190
6CG7	11	3BZ6	47	6CY5	83	3AT2	119	6CN7	155	6CY7	191
6EA8	12	17DQ6B	48	6DT6A	84	5AM8	120	6CS6	156	6DE7	192
6AQ5A	13	6J6A	49	6GK5	85	6EA7	121	6CS7	157	6ER5	193
12AX7	14	6EM7	50	1V2	86	6GM6	122	6DK6	158	6FH5	194
6AU6A	15	6T8A	51	5AQ5	87	6SL7GT	123	6HF5	159	6FM7	195
1G3GT/1B3GT	16	6S4A	52	12AU6	88	3GK5	124	6HS8	160	6JS6A	196
6BZ6	17	6DQ5	53	50L6GT	89	6BJ6A	125	12AT6	161	12BL6	197
6AW8A	18	6AV6	54	3DG4	90	6BR8A	126	12AV5GA	162	12SA7	198
6CG8A	19	3CB6	55	6K6GT	91	6EJ7	127	12SN7GTA	163	12SK7	199
6BK4A	20	2CY5	56	6X4	92	6GE5	128	12SQ7	164	12W6GT	200
6FQ7	21	35C5	57	12B4A	93	6W4GTA	129	16AQ3	165	19T8	201
12BA6	22	6L6GC	58	6GU7	94	8CG7	130	1U4	166	2AF4B	202
6AU4GTA	23	35Z5GT	59	5CL8A	95	6BG6GA	131	1U5	167	3CE5/3BC5	203
12BE6	24	6AF4	60	6BL7GTA	96	6BH8	132	6AH6	168	3CY5	204
OZ4	25	6DE4	61	6DE6	97	6CL6	133	6AS8	169	6AL3	205
6BQ6GTA, B	26	10DE7	62	6GF7	98	6DN7	134	6AT8A	170	6BY8	206
12AT7	27	6BU8	63	1R5	99	6FG7	135	6BQ6GA	171	6CZ5	207
12BY7A	28	6EW6	64	4BQ7A	100	6X5GT	136	6EH7	172	6ES8	208
6GH8A	29	6AN8A	65	4BZ6	101	12AD6	137	6EV5	173	6FV6	209
6AL5	30	6BA6	66	6AK5	102	17JZ8	138	6GN8	174	6JUZ8	210
12DQ6B	31	6EB8	67	6BN4A	103	22DE4	139	6JB6	175	6J5	211
6X8	32	6BH6	68	6CQ8	104	2BN4A	140	12AV7	176	6KA8	212
12BH7A	33	6BN6	69	6C4	105	3DT6A	141	12CU5	177	6KZ8	213
12AX4GTB	34	6AF4A	70	6DR7	106	3V4	142	12C5/CU5	178	12BQ6GA/GTB	214
6BQ5	35	6AM8A	71	12AZ7A	107	5AT8	143	12DT5	179		
6DW4B	36	6BE6	72	17AX4GTA	108	6AB4	144	13EM7	180		

## ALPHA-NUMERICAL LISTING

OZ4	25	6AF4	60	6BN8	152	6DE7	192	6JS6A	196	12BA6	22
1G3GT/1B3GT	16	6AF4A	70	6BQ5	35	6DK6	158	6JU8	210	12BE6	24
1K3/1J3	75	6AG5	186	6BQ6GA	171	6DN7	134	6J5	211	12BH7A	33
1R5	99	6AH6	168	6BQ6GTA, B	26	6DQ5	53	6J6A	49	12BL6	197
1U4	166	6AK5	102	6BQ7A	7	6DQ6B	2	6KA8	212	12BQ6GA/GTB	214
1U5	167	6AK6	151	6BR8A	126	6DR7	106	6KZ8	213	12BY7A	28
1V2	86	6AL3	205	6BS8	147	6DT6A	84	6K6GT	91	12B4A	93
1X2A/1X2B	41	6AL5	30	6BU8	63	6DW4B	36	6L6GC	58	12CA5	149
2AF4B	202	6AM8A	71	6BY8	206	6EA7	121	6SJ7	148	12CU5	177
2BN4A	140	6AN8A	65	6BZ6	17	6EA8	12	6SL7GT	123	12C5/CU5	178
2CY5	56	6AQ5A	13	6BZ7	38	6EB8	67	6SN7GTB	9	12DQ6B	31
3AT2	119	6AS5	77	6B10	153	6EH7	172	6S4A	52	12DT5	179
3A3/3AW3	42	6AS8	169	6CB6A	3	6EJ7	127	6T8A	51	12SA7	198
3BN6	183	6AT8A	170	6CD6GA	43	6EM5	109	6U8A	6	12SK7	199
3BZ6	47	6AU4GTA	23	6CE5/6BC5	154	6EM7	50	6V6GTA	46	12SN7GTA	163
3CB6	55	6AU6A	15	6CF6	188	6ER5	193	6W4GTA	129	12SQ7	164
3CE5/3BC5	203	6AU8A	80	6CG7	11	6ES8	208	6W6GT	79	12W6GT	200
3CY5	204	6AV6	54	6CG8A	19	6EV5	173	6X4	92	13EM7	180
3DG4	90	6AW8A	18	6CL6	133	6EW6	64	6X5GT	136	16AQ3	165
3DT6A	141	6AX3	146	6CL8A	73	6FG7	135	6X8	32	17AX4GTA	108
3GK5	124	6AX4GTB	4	6CM7	39	6FH5	194	7AU7	117	17DQ6B	48
3V4	142	6AY3	81	6CN7	155	6FM7	195	8AW8A	118	17D4A	150
4BQ7A	100	6BA6	66	6CQ8	104	6FQ7	21	8CG7	130	17JZ8	138
4BZ6	101	6BA8A	187	6CS6	156	6FV6	209	8FQ7	110	19AU4GTA	181
5AM8	120	6BC8	82	6CS7	157	6GE5	128	10DE7	62	19T8	201
5AQ5	87	6BE6	72	6CU5	78	6GF7	98	12AD6	137	22DE4	139
5AT8	143	6BG6GA	131	6CU8	189	6GH8A	29	12AT6	161	25CD6GB	182
5BR8	184	6BH6	68	6CW4	190	6GK5	85	12AT7	27	25L6GT	111
5CG8	76	6BH8	132	6CX8	114	6GM6	122	12AU6	88	35C5	57
5CL8A	95	6BJ6A	125	6CY5	83	6GN8	174	12AU7A	8	35W4	10
5T8	185	6BK4A	20	6CY7	191	6GU7	94	12AV5GA	162	35Z5GT	59
5U4GB	1	6BK7B	45	6CZ5	207	6GY6	116	12AV6	37	50C5	5
5U8	44	6BL7GTA	96	6C4	105	6HF5	159	12AV7	176	50EH5	112
5Y3GT	40	6BL8	113	6DA4A	115	6HS8	160	12AX4GTB	34	50L6GT	89
6AB4	144	6BN4A	103	6DE4	61	6JB6	175	12AX7	14		
6AF3	145	6BN6	69	6DE6	97	6JE6	74	12AZ7A	107		



# GALAXY OF GIFTS



tubes

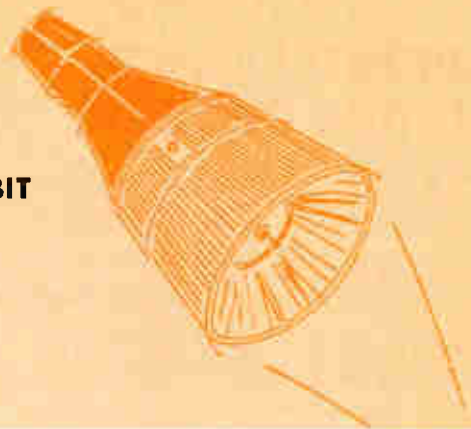


# "Galaxy of Gifts"

## GENERAL ELECTRIC TUBES PUT YOU INTO ORBIT WITH PRIZES OUT OF THIS WORLD

Each time you purchase G-E Tubes from your participating G-E Tube Distributor, you will receive valuable Galaxy of Gifts Prize Coupons. These Coupons may be used to obtain one or more of the wonderful gifts listed below.

When you have accumulated enough coupons for the item of your choice, check your selection on the ORDER REDEMPTION FORM (available from your GE Tube Distributor) fill in your name and address and return the form to your G-E Tube Distributor. He will order your prize for you.



### 3 Coupons

1. TRIO "Magic Mit" Ball Glove. Fun for boys and girls of all ages. Rubber suction cups let you catch ball every time. Helps everyone play like a "Big Leaguer."
2. IDEAL Batman Card Game. Exciting new game based on television's popular Batman Program. Game includes every well-known Batman enemy. Includes Mini Game Board and storage chest.
3. THOR 3 Piece Stainless Steel Tableware Set. Lovely new Country Lane pattern is American made of quality stainless steel by experienced silversmiths. Set includes teaspoon, dinner fork and dinner knife.
4. WEABLY Men's Ties. Top quality, nationally advertised woven fabric ties. Crease resistant with exclusive color guide for proper tie-suit match. Select Blue Stripes, Gray under the knot or Maroon all-over design.

### 5 Coupons

5. IDEAL Motorift Jaguar Gift Set. Perfect for Junior car enthusiasts. Each set includes Motorift body, Jaguar XK-E chassis, motor and conversion pin. Adaptable to any Motorift body style.
6. MASTERPIECE Paintings on Canvas. Beautiful "artist original" reproductions on actual canvas suitable for framing. Large 21" x 27" size is perfect for any room in the home. Choose October Morn by Robert Wood or Free As The Wind by Albe.
7. ARMITAGE Junior Fishing Set. Ideal for youngsters of all ages. Each set includes glass rod, oil metal click reel and heavy duty line.
8. EVERSHARP 6 Piece Stainless Steel Steak Knife Set. Features rugged stag type bone handles and hollow ground "Magic Edge" blades that never need sharpening.

### 10 Coupons

9. HEALTH-WAY Bath Scale. Precision engineered and compact in size, only 1 3/8" high. Finished in heavy baked enamel with easy clean vinyl platform. Features stand-up, pick-up style handle. Colors: Black, pink, white or yellow.
10. REMCO Batman Flying Batplane. Takes off, loops the loop, nose dives and whips through figure 8's with remote control handle. Runs on 3 "D" batteries (not included).
11. SOCK-O-MATIC Multi-Size Wrench. Does the work of four conventional socket wrenches. Fits 1/4", 3/8", 1/2" and 3/4" hex head type screws and nuts. Simple to use, just press wrench over the nut or screw and turn.
12. MANHATTAN Permanent Press Ladies Blouse or Men's Shirt. Both are ideal for casual or business wear. They're permanently pressed, perfectly wearable, straight from the dryer. Men, specify current shirt size. Ladies, indicate desired colors (white, blue, beige or mint) and specify current blouse size.

### 20 Coupons

13. RUGBY Sparcraft All-Purpose Weatherproof Jacket. Perfect for work and leisure wear. Completely waterproof, repels oil and grease stains, fully washable and crease resistant. Features exclusive safety KEEPOCKET, Swingeze Sleeve, Tapered Tite Cuffs and Elastic waistband. Double shoulder yoke and button up collar, provides all weather protection. Colors: Blue, Moroon, Green, Beige.

### 20 Coupons

14. WINSTON Volley Ball and Badminton Set. Two games in one — fun for the entire family. Set includes one official volley ball, four vinyl grip rackets, one 20' net, one complete set of poles, and two plastic shuttlecocks.
15. RIVAL Deluxe Ice-o-mat Ice Crusher. Compact work saver for kitchen or playroom. Crushes fine or coarse. Removable ice cup.
16. BLAZON "Go Tiger" Bike. The newest toy for the younger set. Frame is strong heavy gauge tubing, wheels and handle bars turn on nylon bearings. Contour seat is big, strong and comfortable.

### 30 Coupons

17. ENTERPRISE Aluminum 11 Piece Teflon Cookware Set. Famous Teflon coated cookware includes 1 and 2 quart covered saucepans, 5 quart Dutch oven, 10" fry pan (uses Dutch oven cover), nylon spatula and spoon, plus attractive cookbook and guarantee certificate.
18. SEWARD Car Pack Luggage Man's Stand-up Model. Features crown top and soft plaid sides. A top quality light-weight zipper bag with 3 ply veneer frame for all around use.
19. SHERIDAN 10 CUP Pyrex Carafe and Warmer. Made of lustrous, fine quality silverplate. Features 10 cup beverage capacity with 12 hour candle warming unit. Ideal for every day and special occasion serving.
20. BAR-ZIM Las Vegas Game Chest. A wide range of popular games in an unusual luggage type plastic carrying case. Contents include roulette wheel, chess men, checkers, race horses, dice and dice cup, chips, playing cards and score sheets, plus roulette and horse race lay-outs and complete instruction booklet.

### 40 Coupons

21. POLAROID Swinger Camera. The camera everybody's been talking about. It produces finished black and white pictures in just 10 seconds. The Swinger photo meter tells you when the exposure is perfect. It freezes action both indoors and out, is always in perfect focus. The Swinger is easy to load with Polaroid type 20 roll film and features a built-in flash that merely requires dropping the bulb into the camera.

### 50 Coupons

22. ALVIMAR Floridian Steel Wall Pool. Heavy gauge corrugated steel walls, baked enamel inside and out. Entire pool is reinforced with painted square top rails and clips. Electronically heat sealed liner is made of heavy gauge embossed aqua vinyl plastic. Includes patch material and complete instruction sheet. 8' x 20" — 630 gallon capacity.
23. PFLEUGER Saturn Spin Casting Rod and Reel Combination. A compact high performing reel with adjustable drag for smooth take-up, and action-packed 2 piece, 6 ft. tubular glass rod and 70 yards of 8 lb. test monofilament line.
24. CORNING WARE Royal Family 11 Piece Freeze — Cook — Serve Set. Made of Pyroceram. Heat proof, cold proof, so smooth it almost washes itself. Works perfectly over electricity or gas — in oven or broiler. Set includes 1, 1 1/2, 1 3/4 qt. covered saucepans plus one handle, one cradle and 10" covered skillet and cradle.

### 50 Coupons

25. MARCEL Men's or Ladie's 17 Jewel Personalized Watch. A truly elegant watch personalized with your name on the dial. Features genuine lizard strap, unbreakable main spring, sweep second hand, and gold-tone top and 2 year guarantee. Indicate full name to be personalized on the face.

### 100 Coupons

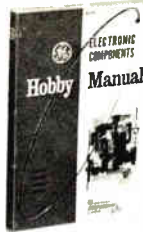
26. MOSSBERG "22" 7 Shot, Clip-type "Automatic" Sporter Rifle. Features automatic loading and ejection plus extremely rapid rate of fire — up to 7 shots in less than 2 seconds. Uses new, "Magic" 3-way 7-shot clip magazine that adjusts to load any of the three popular 22 caliber cartridge lengths. Sights are open rear type with "U" notch, adjustable for windage and elevation; bead front sight.
27. WILSON Men's Sam Snead Blue Ridge Woods (matched set of 1, 2, 3, 4,) or irons (matched set of 3, 5, 7, 9 and putter) or Ladies Patty Berg Cup Defender Woods (matched set of 1, 3, 4) or irons (matched set of 3, 5, 7, 9 and putter). Woods feature Strata-Bloc heads and calfskin Reminder Grips. Irons feature chrome plated heads. Specify right or left hand.
28. MCGREGOR Men's Suedelander Jacket. Features lush, velvety soft imported suede-leather front and 100% worsted wool sleeves. Front and back are quilted for light-weight warmth. Colors: Camel, Brown.
29. GLENEAGLES' Men's Trim-Line Tram Cloth Trench Coat. A double breasted trench coat featuring set-up sleeves, back yoke, all around belt, epaulets, deep storm collar, slash pockets and full plaid lining. Automatic wash and wear. 65% Dacron, 35% Cotton. Specify size.

### 150 Coupons

30. KODAK Instamatic Movie Camera. Instant loading with battery-powered film drive. Shoots 50 continuous feet of film — no flipover. Side cover slides back for drop-in loading. Features automatic electric eye that sets correct exposure for you.
31. COLLEGE HALL Men's 2-piece Sharkskin Suit. Perfect for year 'round use. A superbly tailored suit of 100% all-wool sharkskin. Features natural shoulder design with lap seams and hooked center vent. Colors: Blue, Grey, Olive. Specify size: Regular, Short, Long or Extra Long.
32. HUFFY Boy's or Girl's 26" Bike: Deluxe Eldorado model features rugged construction with control console on tank top. Two-tone pleated bucket seat, spacecraft frame, headlight, chain guard and luggage carrier. Specify boy's or girl's model.
33. SAMSONITE "Flaire" Decorator Card Table and Chair Group. Features large 35" square all steel table with Deepwood vinyl covering and 4 fabric upholstered chairs in Bark Brown. Each piece is easy to fold and easy to move. Handsomely at home anywhere.

# EXPERIMENTER/HOBBYIST ELECTRONIC COMPONENTS

Each electronic component in this series is blister packaged with circuit diagrams showing how educational, practical, and interesting electronic devices can be built. They can also be used in many other applications mentioned in hobby magazines and articles such as found in the General Electric Components Hobby Manual.



## SILICON CONTROLLED RECTIFIER GE-X1

with Schematic for Building  
**Plug In Speed Control for General Purpose Applications**

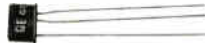
This silicon controlled rectifier is a sensitive, rugged solid state switch for use on 117 volt household circuits. Controlling up to 4.7 amperes the GE-X1 makes a fine speed control for hand tools, blenders, mixers, lamp dimmers, HO train control and automotive alternator regulator. Suggested User Price \$5.00



## LIGHT ACTIVATED SILICON CONTROLLED RECTIFIER GE-X2A

with Schematic for Building  
**"SLAVE" Photoflash for Flashbulbs**

This "mighty midget" is the first light activated SCR power switch. The GE-X2A is a genuine silicon controlled rectifier that is controlled by light. Conducting up to 0.6 ampere, up to 25 volts, it can be used in photoelectric controls, experimental ignition system, SLAVE PHOTOFLASH circuits, miniature light-weight static relays. Suggested User Price \$2.80.



## SILICON CONTROLLED RECTIFIER GE-X3

with Schematic for Building  
**12 Volt Regulated Battery Charger**

A silicon controlled rectifier for high current (up to 13 amps) at lower voltage up to 50 PIV. The GE-X3 is ideal for applications requiring higher current such as battery chargers, electroplating, relay replacement, or low voltage controls operating from automobile or boat batteries. Suggested User Price \$4.80



## SILICON RECTIFIER GE-X4

with Schematic for Building  
**High-Low-Off Control for Heater, Lamp, Motor, Etc.**

For the first time a low priced high current conventional silicon rectifier is available with a 20 amp rating, at voltages as high as 200 PIV. The GE-X4 can be used in Hi-Lo lamp dimmers, motor speed controls, battery chargers, and in conjunction with the GE-X1, or GE-X3, full wave SCR light dimmers or D.C. Power Supplies. Suggested User Price \$1.60



## SILICON CONTROLLED RECTIFIER GE-X5

with Schematic for Building  
**Enlarger Photoliner**

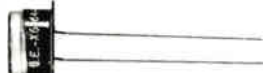
This is a rugged little silicon controlled rectifier capable of handling up to 1.6 amps and 50 volts. Because it can be activated by an extremely low signal power (a momentary signal of 200 micro watts or less) the GE-X5 is invaluable for use in simple remote controls, temperature controls, alarm systems and a host of other imaginative and intriguing devices. Suggested User Price \$3.55



## PHOTOCELL GE-X6

with Schematic for Building  
**(1) Light Flasher  
(2) Night Control**

This cadmium sulfide photo conductive cell is end-illuminated and can be used up to 250 volts peak AC or DC in control applications such as relay controls, automatic light flashers, remote indicator, and punched card or tape readouts. Suggested User Price \$1.40



## REED SWITCH GE-X7

with Schematic for Building  
**(1) Light Flasher  
(2) Burglar Alarm**

This reed switch can carry loads from 15 volt-amperes down to microamperes. The GE-X7 with external magnetic actuation is ideal for liquid-level controls, weight measuring devices, temperature limiters, multiple relays and many other applications. Suggested User Price \$ .80



## TRANSISTOR GE-X8

with Schematic for Building  
**(1) Light Flasher  
(2) Light Target  
(3) Triggered Light Source**

The GE-X8 is a NPN isolated case germanium medium-speed transistor designed for low level switching and amplification in applications such as oscillators, direct-coupled amplifiers, flashers and bistable lamp driver circuitry. Suggested User Price \$ .70.



## TRANSISTOR GE-X9

with Schematic for Building  
**(1) Light Flasher  
(2) Light Target  
(3) Triggered Light Source**

The GE-X9 is a PNP germanium alloy transistor for extremely reliable medium power amplification and switching at low frequency. An ideal companion to the GE-X8, this transistor can be used to build light flasher, light target or triggered light source. Suggested User Price \$ .70



## UNIUNCTION TRANSISTOR GE-X10

with Schematic for Building  
**High Precision Tachometer**  
(For automotive type ignition systems with 12-volt negative ground)

A device which has quite different electrical characteristics than those of the conventional transistor, the unijunction transistor is a three-terminal semiconductor featuring: [1.] Low cost [2.] Low value of firing current [3.] A negative-resistance characteristic that is stable with temperature and life [4.] A stable firing current [5.] A high pulse-current capability. These characteristics make the unijunction invaluable for use in oscillators, timing circuits, voltage sensing circuits, SCR firing circuits and bistable circuits. Suggested User Price \$3.95



## ZENER DIODE GE-X11

with Schematic for Building  
**High Precision Tachometer**  
(For automotive type ignition systems with 12-volt negative ground)

The GE-X11 is a silicon Zener diode rated 8.2 volts at 1 watt. It can be used in low voltage transistor or silicon controlled rectifier applications requiring voltage regulation or voltage transient protection. Suggested User Price \$1.80



## TRIAC GE-X12

with Schematic for Building  
**Remote Control for Lamp or Appliance**

The exciting new G-E TRIAC can be used in many control appliances. Here is a simple, easy-to-build example: Controlling the power for a lamp or appliance from a remote location. This often requires an isolated low-voltage central circuit to eliminate danger of shock or fire, and permits use of inexpensive wiring and small control switch. Suggested User Price \$5.30



## DIAC GE-X13

with Schematic for Building  
**Combination Full-Wave Lamp Dimmer, Lamp Sentinel, and A-C Motor Control**

Want something to turn the lights on when it gets dark and you aren't there? This circuit, using the new G-E DIAC, will do that plus give full symmetrical control from zero to 100% over an A-C load. It does a complete job of dimming lamps, and is suitable for controlling A-C motors. Suggested User Price \$1.60



## THYRECTOR GE-X14

with Schematic for Building  
**Dual-Voltage Power Supply**

Here is a simple power supply ample for handling a typical 100-watt transmitter, providing two voltage outputs from a single circuit. With an adjustable transformer in the line ahead of the step-up transformer, this circuit makes an excellent variable voltage power supply for laboratory experiments. Suggested User Price \$1.15



## THERMISTOR GE-X15

with Schematic for Building  
**Adjustable Temperature Alarm**

Safety conscious? Want an adjustable temperature alarm that will ring a bell, actuate a buzzer, or turn on a light that can be used to detect high temperature in hazardous locations? Here you are. For example, this device can be used in the home to determine when the attic ventilating fan should be turned on. Any temperature from approximately 115° to 165° F may be detected by the thermistor, at which point an alarm can be sounded or a switch actuated. Suggested User Price \$3.45



## SILICON CONTROLLED RECTIFIER GE-X16

with Schematic for Building  
**Battery-Operated Fluorescent Light**

There is often a desire to use a fluorescent lamp in applications where a low-voltage battery is the only source of power. The advantage of these lamps over incandescent lamps are: higher efficiency (you get about four times the light from the same battery current), better light distribution, and less heat dissipation. This high-frequency inverter will find many useful applications for lighting in trucks, yachts, houseboats, buses, mobile homes, camp trailers and aircraft. Suggested User Price \$3.45



## TRANSISTOR GE-M100

with Schematic for Building  
**Citizens Band Receiver and Control Unit (27MC)**

A top quality germanium mesa transistor for the ham, hobbyist and citizens bander. The GE-M100 is packaged with complete circuit diagrams covering the construction of a transistorized citizens band receiver and remote control units. Suggested User Price \$1.20



## TRANSISTOR 2N107

with Schematic for Building  
**(1) Audio Amplifier  
(2) Single Transistor Radio Receiver  
(3) Code Oscillator  
(4) Loudspeaker Amplifier  
(5) 2 or 3 Transistor Receiver**

An alloy junction audio transistor PNP that's ideal for hobbyist projects such as a simple audio amplifier; one, two, or three transistor radios; code practice oscillator, and loudspeaker audio amplifier. Suggested List Price \$1.25



## TRANSISTOR 2N170

with Schematic for Building  
**(1) Three Transistor Radio  
(2) Direct Coupled Amplifier  
(3) Pre-Amplifier**

A low voltage high frequency NPN transistor is an ideal companion to the 2N107 listed above. The 2N170 can be used to build pocket radios, amplifiers and other interesting devices. Suggested List Price \$1.70



## UNIUNCTION TRANSISTOR 2N2160

with Schematic for Building  
**(1) Transistor Metronome  
(2) Code Practice Oscillator**

A device which has quite different electrical characteristics than those of the conventional transistor, the unijunction transistor is a three-terminal semiconductor featuring: [1.] Low cost [2.] Low value of firing current [3.] A negative-resistance characteristic that is stable with temperature and life [4.] A stable firing current [5.] A high pulse-current capability. These characteristics make the unijunction invaluable for use in oscillators, timing circuits, voltage sensing circuits, SCR firing circuits and bistable circuits. Suggested List Price \$2.75



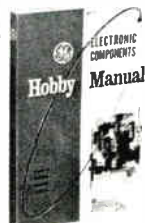
## Transistor Manual, ETR-3296

Nineteen fact-filled chapters containing transistor theory; interesting transistor circuits for radios, amplifiers, oscillators, specifications, etc.; valuable information needed by every engineer, hobbyist, experimenter. Only \$2.00



## Electronics Experimenter Hobbyist Manual, ETR-3960

Every engineer, experimenter, hobbyist, student, and technician can learn new applications for electronic components with the simple but interesting and useful circuits in this manual. Only \$1.50



## Porta-Color Television

(Continued from Page 1)

shown in the illustration, the beam can be moved by rotating the magnet for static adjustment. The field produced by the vertical yoke current flowing thru the coil on the core follows the same path as the permanent magnet field. It therefore moves the associated beam vertically at a vertical rate. In addition, the coil polarity may be changed or completely removed from the circuit by interchanging the wiring on the terminal strip at the top of the plastic convergence assembly.

The horizontal convergence assembly is almost identical to the vertical except the core is a "U" shaped configuration with a coil wound on each leg of the core. The two coils are connected in series causing the two ends of the core to be opposite in polarity. The core is separated in the center by a movable permanent magnet which is magnetized in the same manner as the vertical permanent magnet. When the magnet is rotated the effect is the same as for the vertical magnets except that the beam deflection is horizontal. Besides the permanent magnet adjustment for the horizontal static correction, each of the two magnet assemblies is mounted on a slider arrangement so that either assembly may be moved close to, or away from the neck of the tube horizontally which controls the outside gun raster sizes. These sliders are captivated and locked into position with screws. The permanent static convergence magnets are locked into position by cement. When completing set-up procedure make certain that the adjustments are locked into position.

## TELEVISION

### AY CHASSIS — VERTICAL RETRACE LINES

A few complaints of bright vertical retrace lines may be encountered during some transmissions.

Network stations are carrying bandwidth information which appears as keying pulses in the vertical blanking interval near the bottom. These pulses go deep into the white range and if located too close to the bottom of the blanking interval they may unblank the picture tube before vertical retrace is complete, hence the white retrace lines.

Where this condition appears on an AY Chassis we recommend that you increase the value of R212 from the normal 47K to 56K or even to 62K, should it prove necessary. Do not increase beyond the value necessary to eliminate the retrace lines. Be sure to check the receiver for correction while the keying pulses are present. (Roll down the blanking bar and observe.)

Should the above change result in the vertical linearity control being on the end, after re-adjustment, change R210 from 1.5 Meg. to 1. Meg.

The same approach may be used with other than the AY Chassis if they exhibit this problem. In every case, increase the value of the vertical peaking resistor R212 or equivalent only enough to clear the retrace problem.

### AB, AA CHASSIS — HORIZONTAL HOLD

This will clarify some aspects of the horizontal system of this chassis and is also applicable to other chassis using this phase detector and multivibrator horizontal oscillator.

The horizontal pull-in range of the AB chassis is normally 3 to 5 bars from either side. On some receivers this range may be less, due to accumulated tolerances of components. This may

create a problem of frequent hold control re-adjustment in critical reception areas, so we are furnishing additional information to assist you in correcting any complaints of this nature.

Basically proper pull-in range is dependent upon proper adjustment of the horizontal frequency circuit and proper balance of the phase detector.

The horizontal frequency adjustment should be performed according to the Service Manual. If the receiver has insufficient pull-in range after completing the frequency adjustment, the following is recommended.

Change capacitor C252 from 47 to 68 mmf to correct the balance of the phase detector. This capacitor is available from the top of the chassis and it will usually be more convenient to add an extra capacitor of from 18-24 mmf. across the existing C-252.

If a soldering iron and extra capacitor are not available, the following slightly less effective cure (which will probably prove adequate in the majority of cases), may be used.

As an additional step to the routine set-up of horizontal frequency, short the clipper grid to ground and adjust the horizontal hold R257 until the picture floats across the screen. Remove the short and check performance.

#### NOTE A.

The method used for determining a receiver pull-in range is as follows:

1. Set up horizontal frequency according to Service Manual, and tune in a moderately weak signal.
2. Turn the horizontal hold control completely C-clockwise until station falls out of sync. (It may be necessary to switch off and back on channel to show sync. fall out.)
3. Turn hold control slowly clockwise and count the number of bars from which the picture snaps into sync.
4. Repeat step 2 in the full clockwise direction and step 3 in the C-clockwise direction. Again, the number of bars showing when the picture snaps into sync. is the pull-in range.

#### NOTE B.

1. Each bar represents 60 cycles off horizontal frequency.
2. Bars sloping downward left to right indicate frequency is too high.
3. Bars sloping downward, right to left indicate frequency is too low.

### DB CHASSIS HORIZONTAL HOLD

Adjustment of the horizontal hold is considerably simpler in the DB Chassis than in previous chassis using multivibrator horizontal circuitry. The set-up procedure follows:

With controls set for normal operation, short Test Point V (clipper grid) to chassis ground and adjust L 251 for the point where the picture just "floats" horizontally across the screen. (Vertical roll during this operation may be corrected by slight readjustment of the vertical hold control.)

Use Order Coupon Below

### ORDER COUPON

Order from your local G. E. electronic components distributor or mail this form to:

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**LEADERSHIP IN ELECTRONICS!**  
**LEADERSHIP IN SERVICE AIDS . . . and here are more GE-FIRSTS**

**TRANSISTOR CIRCUIT  
TROUBLE-SHOOTING  
COURSE, ETR-4423**



General Electric has created a new course on transistor circuit trouble-shooting, including application and testing. ETR-4423, contains three volumes with over 80 pages in each volume. This course is designed especially to meet the on-the-job needs of the

electronic service technician who will be servicing transistorized radios, stereos, TV, and other home entertainment products yet to come.

Transistorized circuit trouble-shooting is taught through the new and highly effective self-study method — PROGRAMMED INSTRUCTION.

Programmed Instruction is a scientific new method of self-teaching which presents information in a logical sequence of small steps, with immediate feedback-of-results to the learner. It is based upon extensive research into the way people learn, and is now being successfully used throughout American industry.

To compare Programmed Instruction with traditional teaching, read the following example of textbook instruction:

*A clamp circuit is designed to filter out undesirable low input signals by utilizing a reverse biased diode that blocks low inputs — so that electrons flow in the circuit only when the input signal voltage exceeds that of the battery bias.*

Now, without looking back, briefly describe the function and operation of the clamp circuit. Chances are that you had difficulty. You probably had to go

back and read the sentence again since you did not know at the onset what would be required. The sentence, as in all ordinary tests, presents information, but does not teach.

Programmed Instruction differs from ordinary text by focusing your attention on specific points to be learned. You read a small unit of instruction — then write your answers to questions based on that information. After writing each answer, you are immediately shown the correct answer, and can then go on to the next step. By proceeding in small measured steps, you learn rapidly, efficiently, and with no errors.

You will acquire immediate confidence in your ability to master solid state circuitry.

You will be developing a sound base of practical knowledge of transistors and their application on which you will be building an even greater knowledge through your daily service experience.

Ask your distributor for the new General Electric transistor circuit trouble-shooting course, ETR-4423. If he is unable to supply you, use the order coupon on page 7. Price is only \$14.25 for this three volume course.



Vol. 18 No. 2 Summer, 1966

**In this issue:**

	Page
G-E Porta-Color TV Picture Tube — II	1
Bench Notes	2
Receiving Tube Popularity Listing	3
Galaxy of Gifts	4
Experimenter/Hobbyist	
Electronic Components	6
Service Notes	7

Techni-talk on AM, FM, TV Servicing, published quarterly by ELECTRONIC COMPONENTS DIVISION, GENERAL ELECTRIC COMPANY, OWENSBORO, KY. In Canada: Canadian General Electric Co., Ltd., 189 Dufferin St., Toronto 3, Ontario. R. G. Kempton, Editor. Copyright 1966 by General Electric Company.



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