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SEPTEMBER 1966/50¢

PF Reporter™

PHOTOFACT

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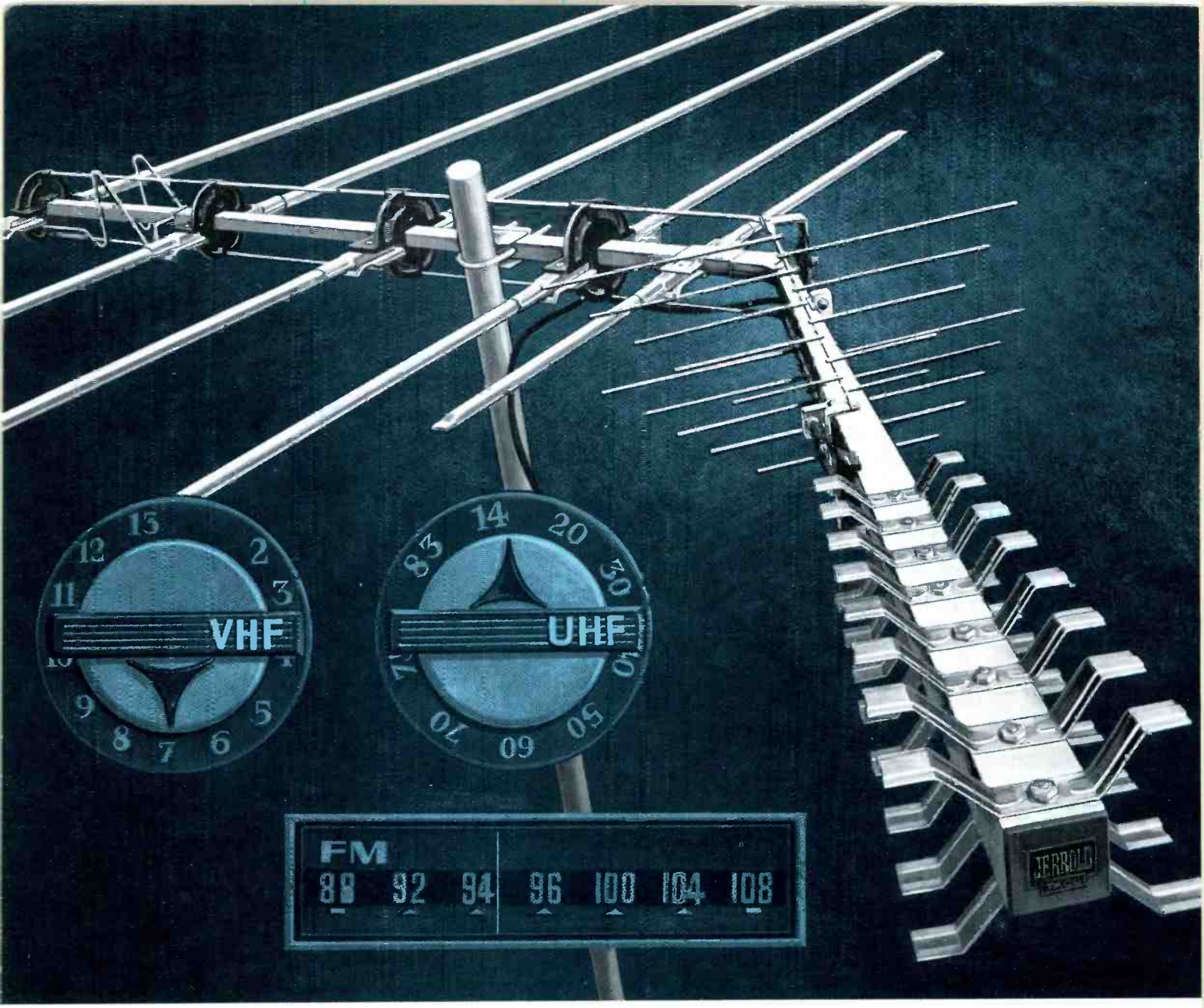

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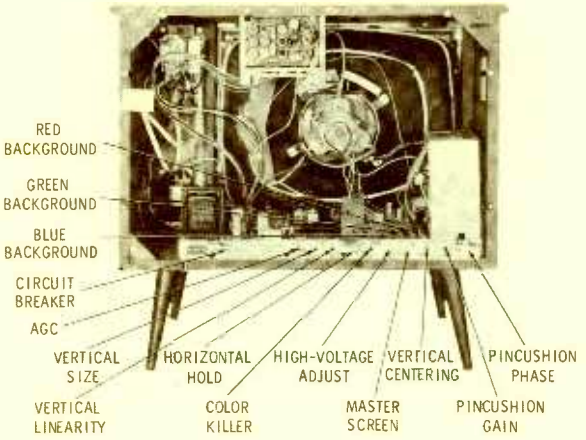
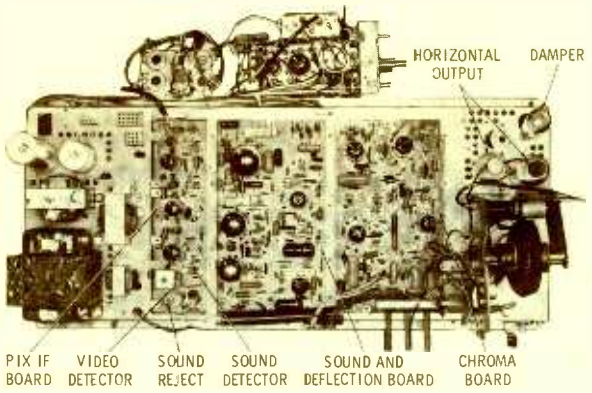
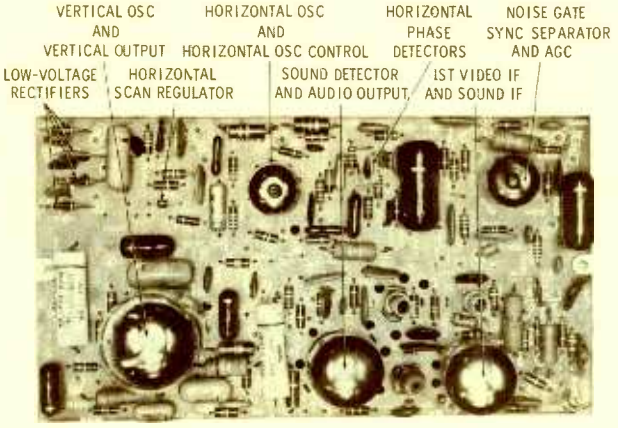
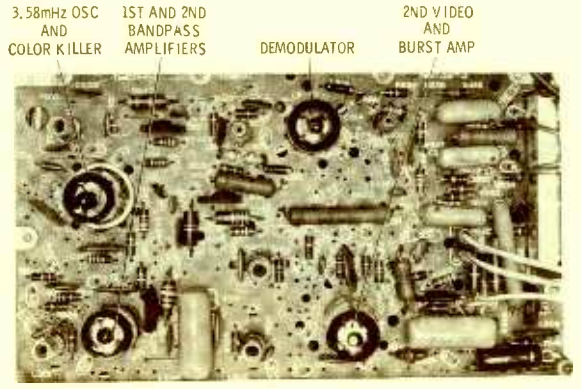
Circle 1 on literature card

Admiral









Adimral Model LG 5301W Chassis G1355-2

Employing a twin-pentode 6LE8 chroma demodulator and no difference amplifiers, Admiral's new 23" color console is a unique departure from conventional design. The absence of difference amplifiers is a result of the high inherent amplification characteristic of the 6LE8 (basically a modified 6HB6), which makes the added amplification of "Y" amplifiers unnecessary. R-Y and B-Y detection is accomplished, in a more or less conventional manner, at the plates of the twin-pentode demodulator. G-Y, derived from the 6LE8 screen, is developed in a more involved fashion using screen-current inversion and reflex amplification.

Separate screen controls and a service switch have also been eliminated in the design of this set. Instead, the screens of the 23EGP22 rectangular picture tube have been tied together and a "master" screen control employed. Conventional separate bias adjustments for the red, blue, and green grids have been retained, and are labeled "background" controls. The master screen and background adjustments are located on the rear apron of the chassis.

The injection-locked 3.5-MHz oscillator uses the pentode section of a 6GH8A triode-pentode. The triode section of the same tube is used in the color-killer stage. Other chroma-circuit tube types include a 6Y9 double pentode, shared by the burst amplifier and 2nd video amplifier, and a 6X9 triode-pentode, functioning in the 1st and 2nd bandpass amplifier stages.

Another interesting feature is the absence of a voltage-regulator stage. A feedback-regulating system has replaced the conventional 6BK4 regulator circuits. Pulses fed back from the flyback transformer are rectified and used to regulate the high voltage by supplementing the horizontal-output-tube bias.

The transformer-powered, low-voltage supply uses four solid-state diodes in a bridge-rectifier configuration with B+ overload protection provided by a circuit breaker. The filaments are protected by a No. 22 fuse wire.

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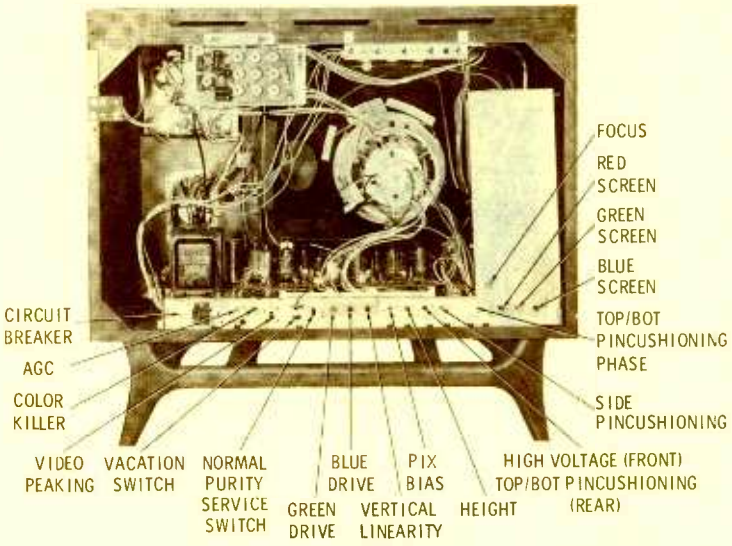
Hoffman
Model W-5002, B
Chassis 913–162215

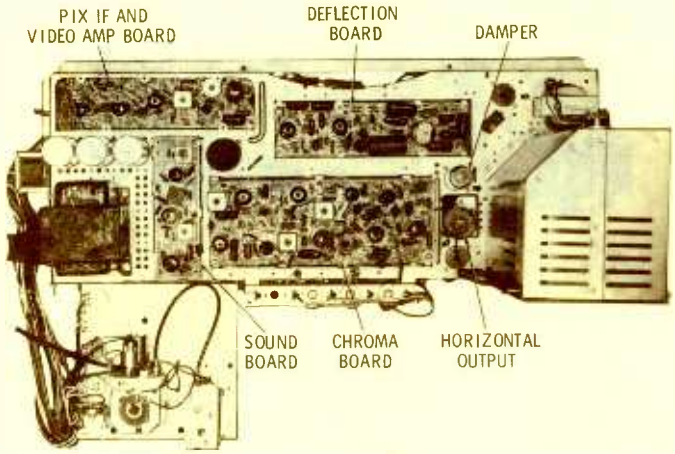
The console television pictured here is Hoffman's 23" color set, using a 23EGP22 rectangular picture tube. The chassis layout is conventional, with four circuit boards contained on a horizontally mounted main chassis. Circuit features include pincushion correction, and automatic degaussing.

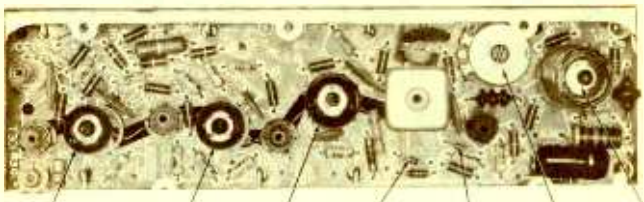
The transformer-powered, low-voltage supply uses two silicon diodes in a voltage-doubler configuration and is equipped with an **Instavision** circuit which keeps the tube filaments at a low voltage level when the set is off, providing instant sound and a picture in 8 seconds once the set is turned on. A "vacation" switch cuts off the circuit if conventional off-on action is desired. Overload protection is provided by a circuit breaker in the B+ circuit and a fuse wire in the main filament source.

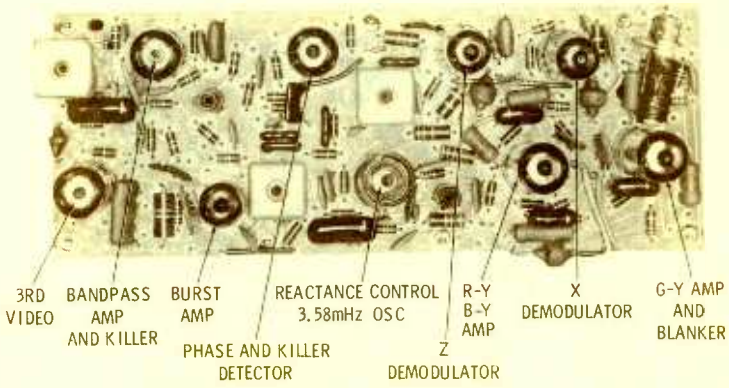
A manually-operated "color defeat" switch, located in the secondary of the bandpass amplifier transformer, opens the input of the color demodulators to kill extraneous color during monochrome reception. Another performance feature is a "cinema" control which varies the red control grid bias, permitting the viewer to adjust the gray setting from a sharp black-and-white to a browntone shade, if desired. Also provided is a circuit feature which lights the three color controls when a color program is being received. A current-operated relay in the bandpass amplifier plate circuit applies filament voltage to the three color-control lamps when the amplifier is conducting.

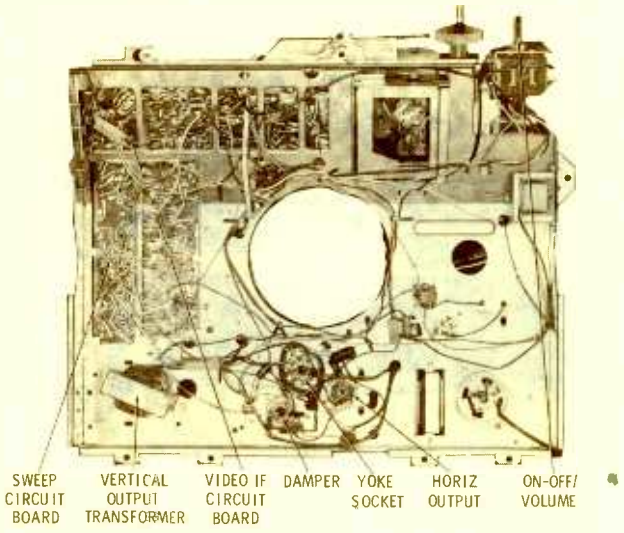
In the chroma circuits, two 6GY6 pentodes are used in the separate X and Z demodulators which feed R-Y, G-Y, and B-Y amplifiers, each using one-half of a 6GU7 dual triode. The pentode section of a 6GH8A triode-pentode performs as the bandpass amplifier, with the triode section serving the color-killer stage. A 6JU8 quadruple diode is shared by the killer and phase detectors. The reactance control stage and a 3.58-MHz oscillator use the triode and pentode sections of a 6GH8A triode-pentode. The 6GU7 dual-triode used by the G-Y amplifier is shared with the blanker circuit. Other tube types used in the set include a 3A3 high-voltage rectifier, 6DW4 damper, 6BK4B shunt regulator, a 6JE6A pentode in the horizontal output, and a double-triode 6FQ7 in the horizontal oscillator.

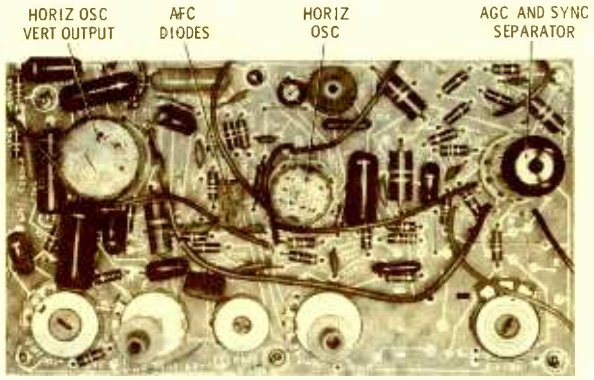


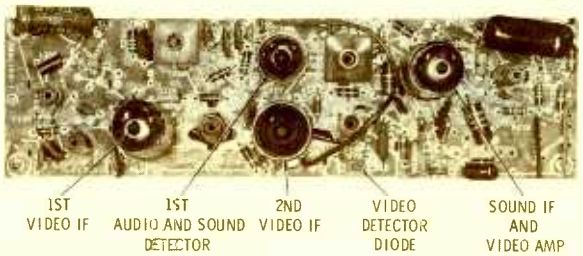












RCA
Model AH 196 ER, WR
Chassis KCS161B

Shown here is RCA's new 21″ black-and-white portable model using a 21FVP4 picture tube. The main chassis is vertically mounted and utilizes two printed circuit boards on which are mounted all primary circuits with the exception of the horizontal-and audio-output stages, damper stage, and power supplies.

The transformerless, low-voltage power supply consists of two silicon diodes connected in a full-wave voltage doubler circuit with a 5-ohm fusible resistor providing surge protection. A series heater string is used in the receiver. B+ overload protection depends on a circuit breaker, with line protection provided by an AWG 34 fuse wire.

Video information is provided the CRT cathode circuit by a two-stage video IF (using two 4JD6 pentodes), a conventional crystal detector, and a video amplifier which uses the pentode section of an 11KV8 triode-pentode. The sound section consists of the triode section of the 11KV8, which performs as the sound IF, and a 6HZ6 pentode which serves the dual function of sound detector and 1st audio amplifier. The audio-output stage uses a 6HG5 pentode.

The synchrophase horizontal oscillator, which is essentially a stabilized blocking oscillator, uses a dual-triode 8FQ7. A dual-selenium diode package performs as the phase detectors in the control portion of the oscillator, and a 22JF6 pentode is used in the horizontal-output stage. A scope is not needed when setting up the synchrophase circuit. Instead, adjustment is accomplished by shorting out the phase coil, disabling the sync by grounding the sync tube grid, and adjusting the hold control until a picture floats by. The phase coil short is then removed and the phase coil adjusted until the picture floats by once again. Finally, remove the sync short and the picture should lock in without instability.

A dual-triode 13GF7 is used in the combination vertical multivibrator vertical-output stage. Other tube types include a 17AY3 diode in the damper circuit, either a 1G3GT or 1B3GT diode in the high-voltage stage, and a triode-pentode 8LC8, used in the AGC and sync stages.

Westinghouse ..... PREVIEWS of new sets

Westinghouse Model H-ck6520B Chassis V2650-3

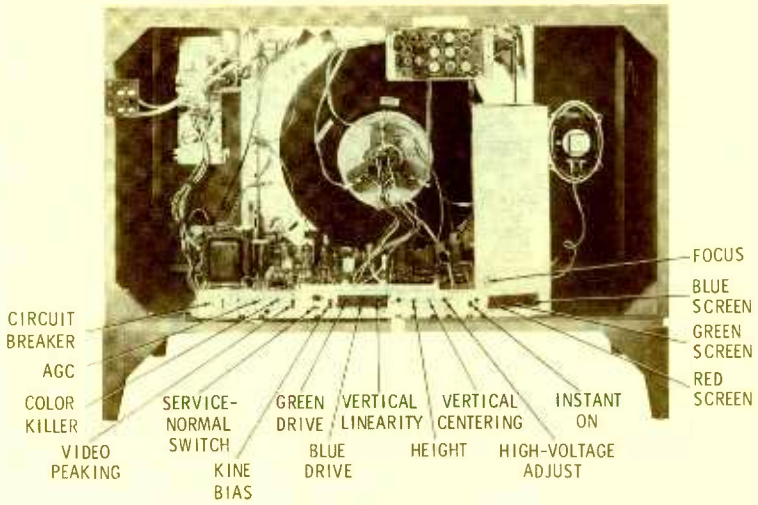
Automatic degaussing and an "Instant On" circuit are two features of Westinghouse's 21" console, shown here. A 21FJP22 round 70° picture tube is used in the set. The chassis layout consists of a horizontally mounted chassis with four circuit boards.

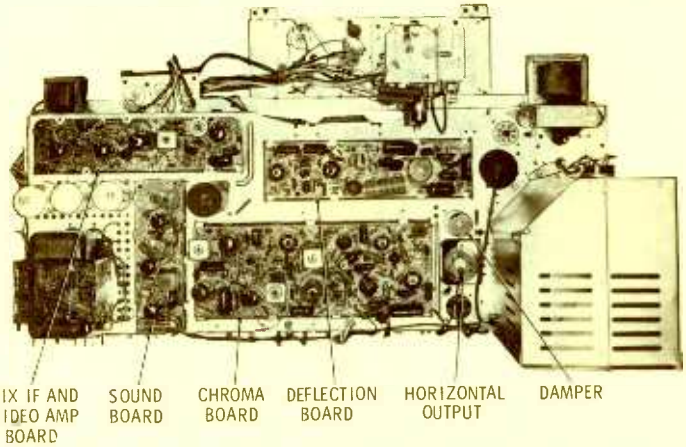
In the chroma circuits, separate X and Z demodulators (6GY6 pentodes) are used in a conventional design, feeding 6GU7 dual-triode Y amplifiers. The blanker circuit shares one of two 6GU7's with the G-Y amplifier. The pentode section of a 6GH8A triode-pentode is employed in the bandpass amplifier stage, with the triode section of the same tube serving as the color killer. Other tubes used in the chroma circuits include a 6EW6 pentode in the burst amplifier, a 6JU8 quadruple diode shared by the color-killer detector and phase-detector circuits, and another 6GH8A triode-pentode performing the dual function of reactance control and a 3.58-MHz oscillator.

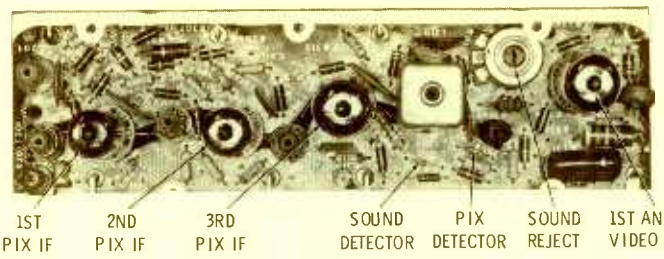
The transformer-powered, low-voltage supply uses two silicon diodes in a full-wave, voltage-doubler circuit with B+ overload protection provided by a reset-type circuit breaker. The filaments are protected by a fuse wire. The "instant on" feature, designed to reduce warm-up time, accomplishes this function by maintaining a low filament voltage when the set is turned off. A switch is provided to remove the "instant on" circuit if the set is not to be played for an extended period.

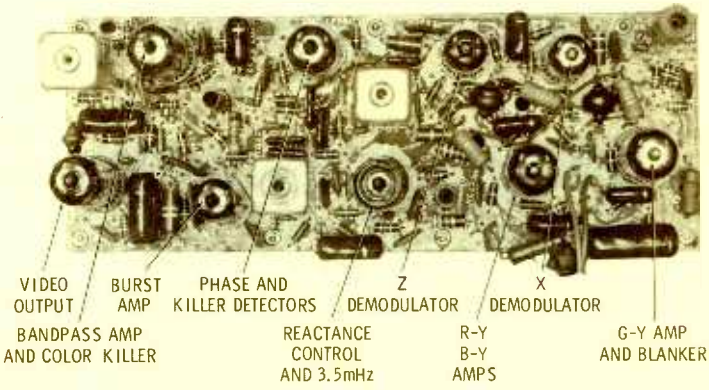
Other tube types and stages include a three-stage video IF, using three pentode-type tubes (6JH6, 6GM6, and 6EJ7), and a three-stage video amplifier section using a triode-pentode 6AW8A and a 12BY7A pentode. The video output is DC coupled to the CRT. The sound section uses a 6EW6 pentode in the IF and a 6HZ6 pentode in the quadrature detector.

A twin-triode 6FQ7 is used in the horizontal oscillator, with two selenium diodes in the common-cathode AFC circuit and a 6JE6 beam pentode in the output stage. The vertical-deflection circuit uses a twin-triode 6GF7 in the combination vertical-oscillator vertical-output stage. The pentode section of a 6KA8 triode-pentode is employed in the AGC and noise-inverter circuit.









See PHOTOFACT Set 721, Folder 3

Mfr: Motorola

Chassis No: TS-908/Y

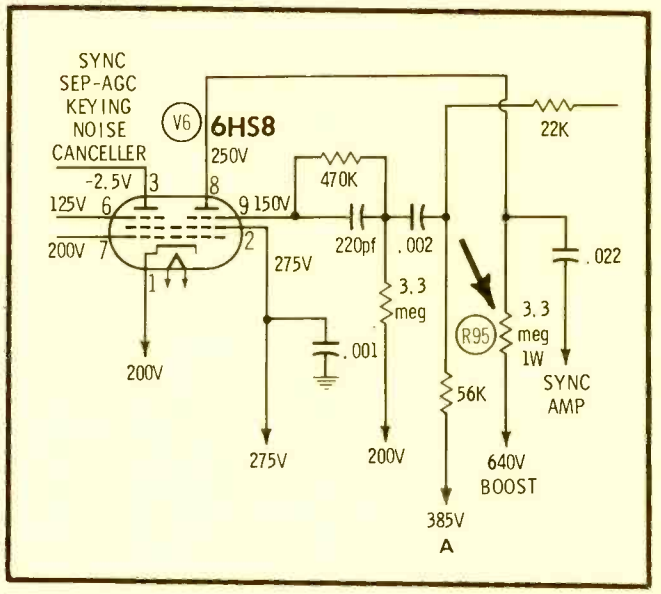
Card No: MO TS-908-1

Section Affected: Sync.

Symptoms: No vertical or horizontal sync. No voltage at plate (pin 8) of V6, sync separator.

Cause: Open plate load resistor in sync separator portion of V6.

What To Do: Replace R95 (3.3 meg, 1w).



Mfr: Motorola

Chassis No: TS-908/Y

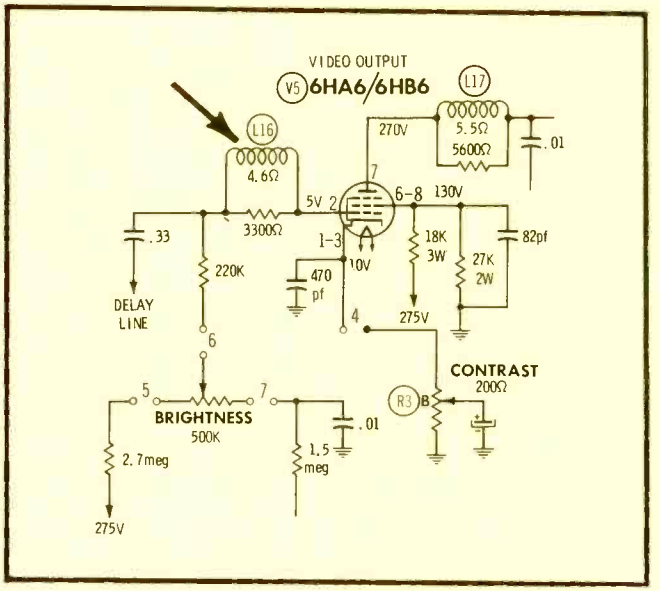
Card No: MO TS-908-2

Section Affected: Pix.

Symptoms: Black-and-white pix smeared, but steady.

Cause: Open peaking coil or coils in video-output circuit.

What To Do: Replace or resolder leads on coil L16 and/or L17.



Mfr: Motorola

Chassis No: TS-908/Y

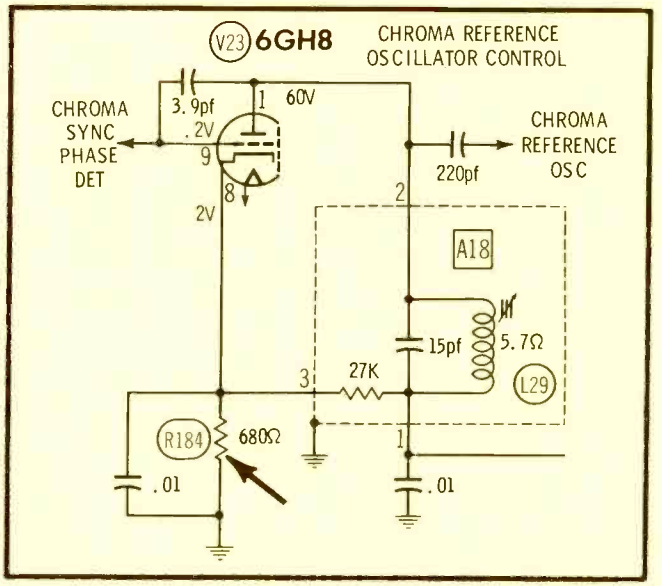
Card No: MO TS-908-3

Section Affected: Color Sync.

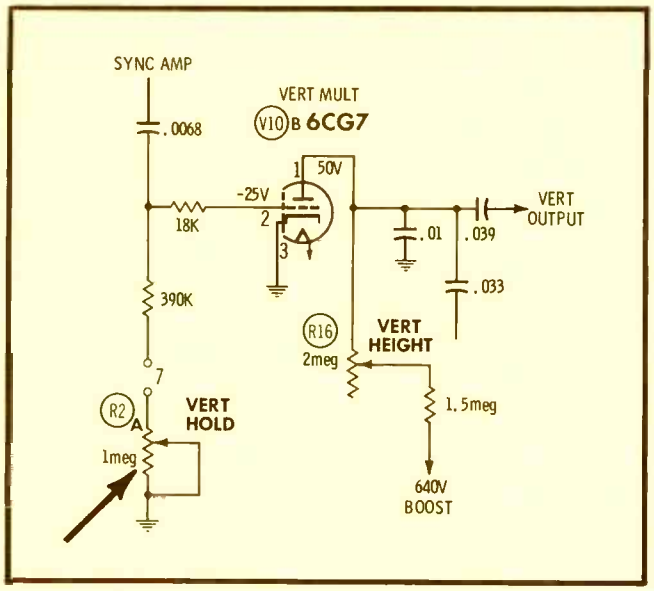
Symptoms: Black-and-white pix ok. Color drifts in and out of color sync. Voltage at cathode (pin 8) of V23, chroma reference oscillator control, high and unstable.

Cause: Resistor in cathode circuit of V23 overheats and opens.

What To Do: Replace R184 (680 ohms); also replace V23.



See PHOTOFACT Set 721, Folder 3



See PHOTOFACT Set 721, Folder 3

Mfr: Motorola

Chassis No: TS-908/Y

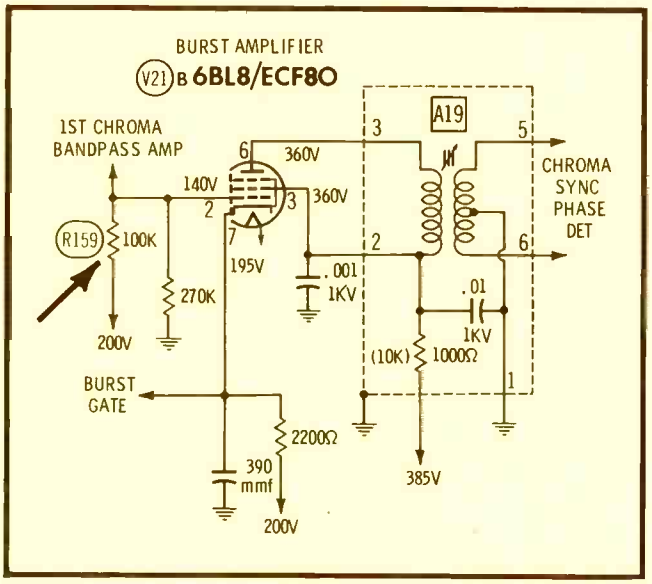
Card No: MO TS-908-4

Section Affected: Sync.

Symptoms: Vertical hold drifts and is intermittent.

Cause: Defective vertical-hold control.

What To Do: Replace vertical-hold control R2A (1 meg).



Mfr: Motorola

Chassis No: TS-908/Y

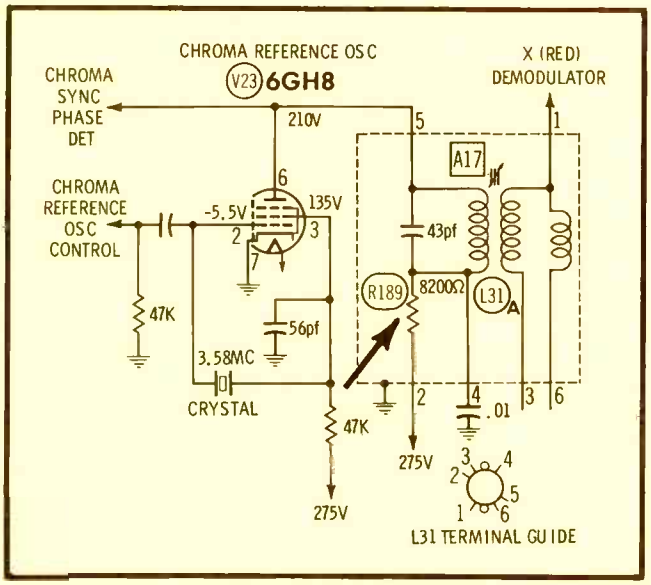
Card No: MO TS-908-5

Section Affected: Color pix.

Symptoms: Black-and-white normal. No color pix. Voltage is low at control grid (pin 2) of burst amplifier V21B.

Cause: Voltage-divider resistor in control grid of burst amplifier increased in value.

What To Do: Replace R159 (100K).



Mfr: Motorola

Chassis No: TS-908/Y

Card No: MO TS-908-6

Section Affected: Color pix.

Symptoms: Black-and-white normal. No color pix. No voltage at plate (pin 6) of chroma reference oscillator V23.

Cause: Open series dropping resistor in plate circuit of V23.

What To Do: Dismantle can and replace R189 (8.2K).

See PHOTOFACT Set 787, Folder 4

Mfr: Sylvania

Chassis No: D01-1, -2, -5

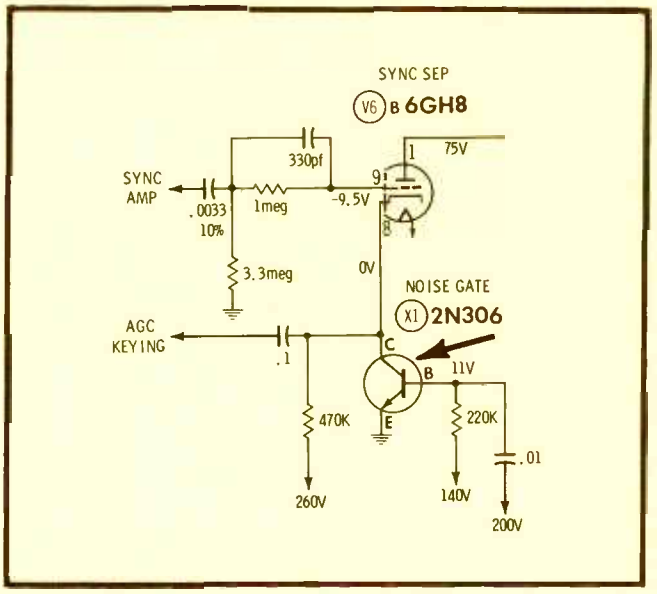
Card No: SYL D01-7

Section Affected: Sync.

Symptoms: No vertical or horizontal sync.

Cause: Defective noise-gate transistor.

What To Do: Replace noise-gate transistor X1, 2N306.



Mfr: Sylvania

Chassis No: D01-1, -2, -5

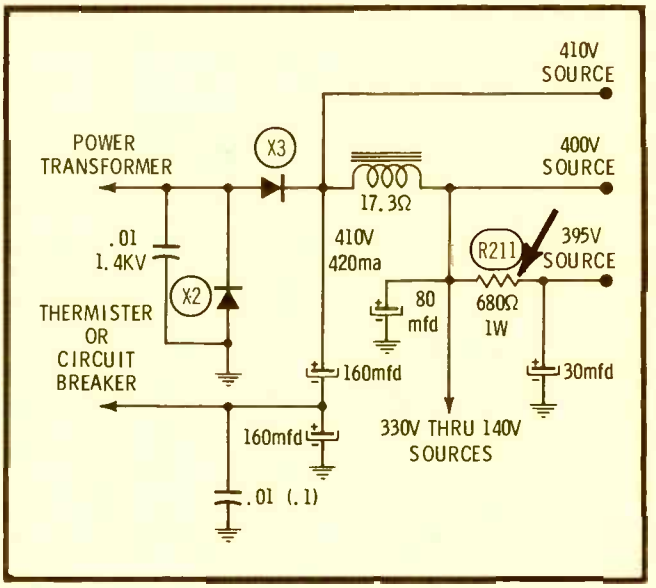
Card No: SYL D01-8

Section Affected: Raster and sound.

Symptoms: No raster; no sound; no voltage at output of 395V source.

Cause: Open B+ resistor in 395V low-voltage

What To Do: Replace R211 (680 ohms, 1W). source.



Mfr: Sylvania

Chassis No: D01-1, -2, -5

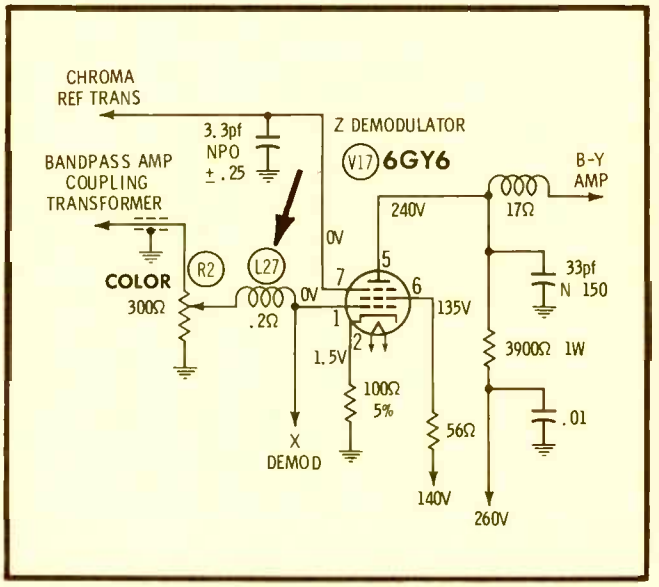
Card No: SYL D01-9

Section Affected: Color pix.

Symptoms: Color pix disappears intermittently. Black-and-white pix normal.

Cause: Open RF choke in X and Z demodula-

What To Do: Replace L27 (5.6 mh). tor-input circuit.



See PHOTOFACT Set 787, Folder 4

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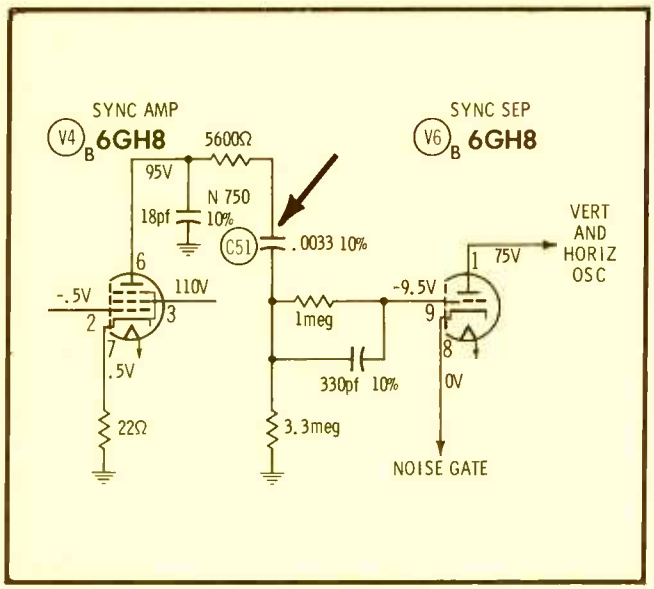


See PHOTOFACT Set 787, Folder 4

Mfr: Sylvania

Chassis No: D01-1, -2, -5

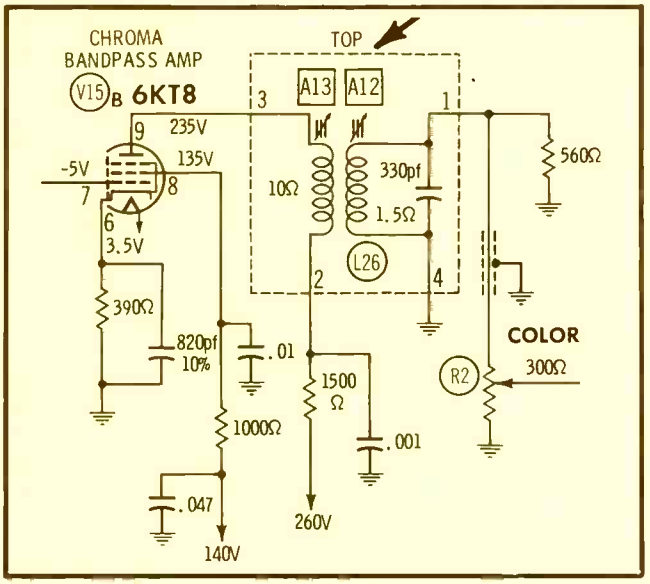
Card No: SYL D01-10

Section Affected: Sync.

Symptoms: Horizontal tearing and vertical roll. Positive voltage on control grid (pin 9) of sync separator V6B.

Cause: Shorted sync amplifier/sync separator coupling capacitor.

What To Do: Replace C51 (.0033 mfd, 10%).



Mfr: Sylvania

Chassis No: D01-1, -2, -5

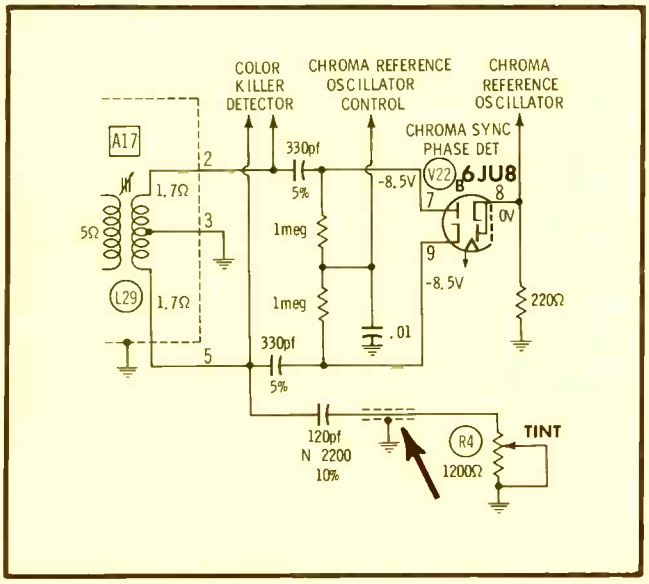
Card No: SYL D01-11

Section Affected: Color pix.

Symptoms: Color pix fades in and out. Black-and-white pix normal.

Cause: Chroma bandpass amplifier transformer opens intermittently.

What To Do: Resolder leads on chroma bandpass amplifier transformer L26, or replace if defective.



Mfr: Sylvania

Chassis No: D01-1, -2, -5

Card No: SYL D01-12

Section Affected: Color pix.

Symptoms: Tint control R4 has no effect on tint.

Cause: Defective cable in tint control circuit.

What To Do: Replace shielded cable.

Compare Color Generators

look at the rest... and you'll buy the best, new B&K model 1245

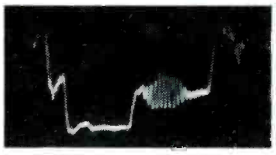
The all solid-state B&K Model 1245 Color Generator duplicates the waveforms transmitted by a color TV station.

Adherence to these waveforms makes it easy to converge the color tube, check sync and make other raster adjustments . . . and the color generator with station quality signal will be able to sync next year's sets. Generators with compromise waveforms do not give you this obsolescence protection.

Here are oscilloscope photographs from the outputs of two typical competitive color generators, one transistorized and one tube type, and the B&K Model 1245. The detailed analysis with each photograph shows a few of the reasons why you'll save time and effort with B&K.

COLOR **CROSSHATCH**

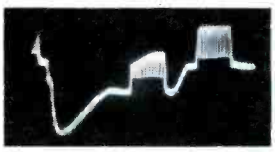
STANDARD STATION SIGNAL



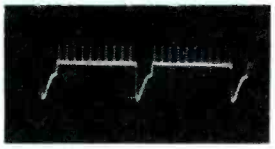
One horizontal sync pulse with its color burst.

Two lines showing horizontal sync pulse with black and white tv signal.

TRANSISTORIZED B&K MODEL 1245

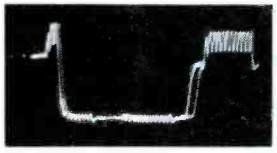


Good duplication of station signal including back porch. If the set won't sync, the set is defective.

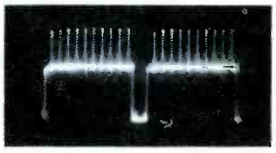


Well defined back porch on horizontal sync pulse permits accurately setting color killer and almost eliminates need to adjust brightness and contrast.

TRANSISTORIZED GENERATOR A

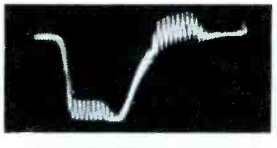


No back porch causes unstable color sync. Burst amplitude compression may permit sync on wrong color bar.

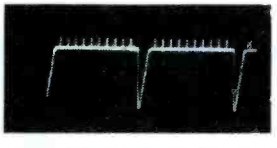


Square wave horizontal sync pulse with no back porch and poor dc coupling forces adjustments of brightness, contrast & fine tuning to obtain usable pattern.

GENERATOR B

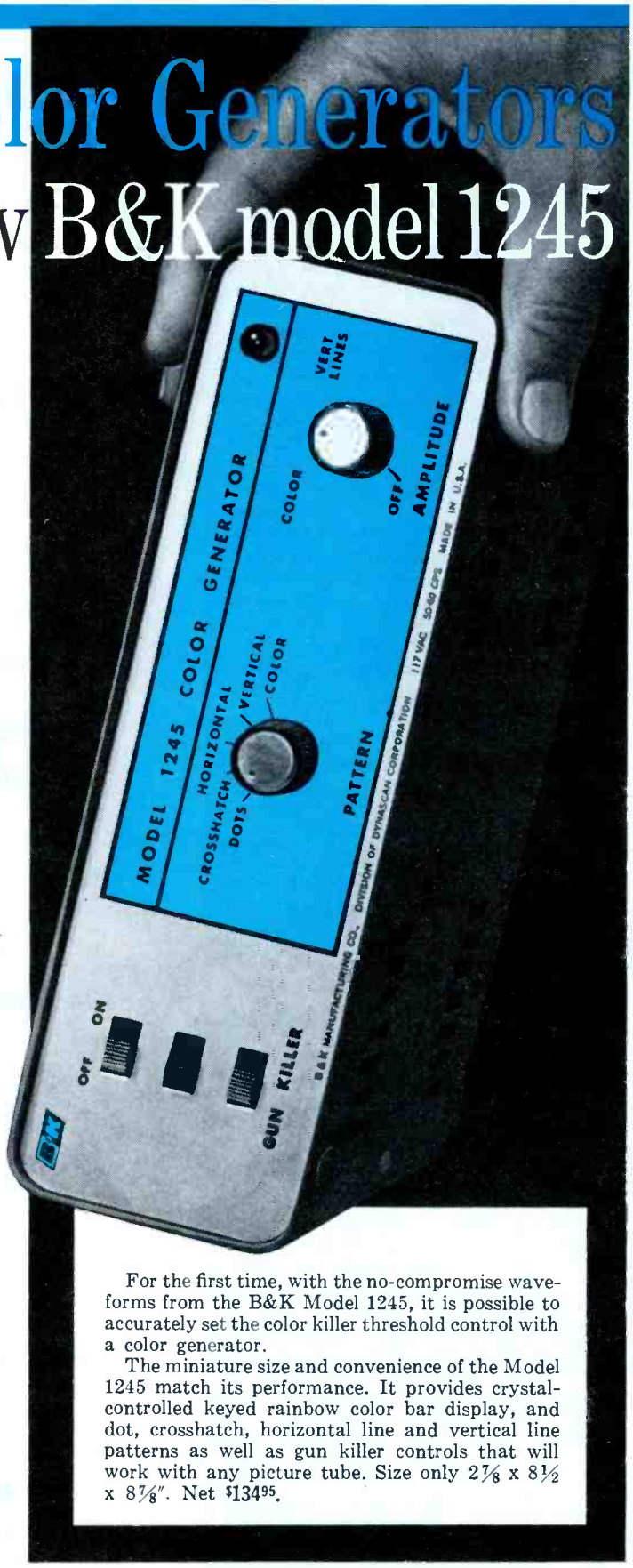


No back porch; color information on top of sync-pulse makes sync difficult on some sets.



Complete absence of any back porch necessitates readjustment of brightness, contrast and fine tuning to obtain a usable pattern.

See your B&K Distributor for a demonstration or write for Catalog AP22.



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PF Reporter™

PHOTOFACT

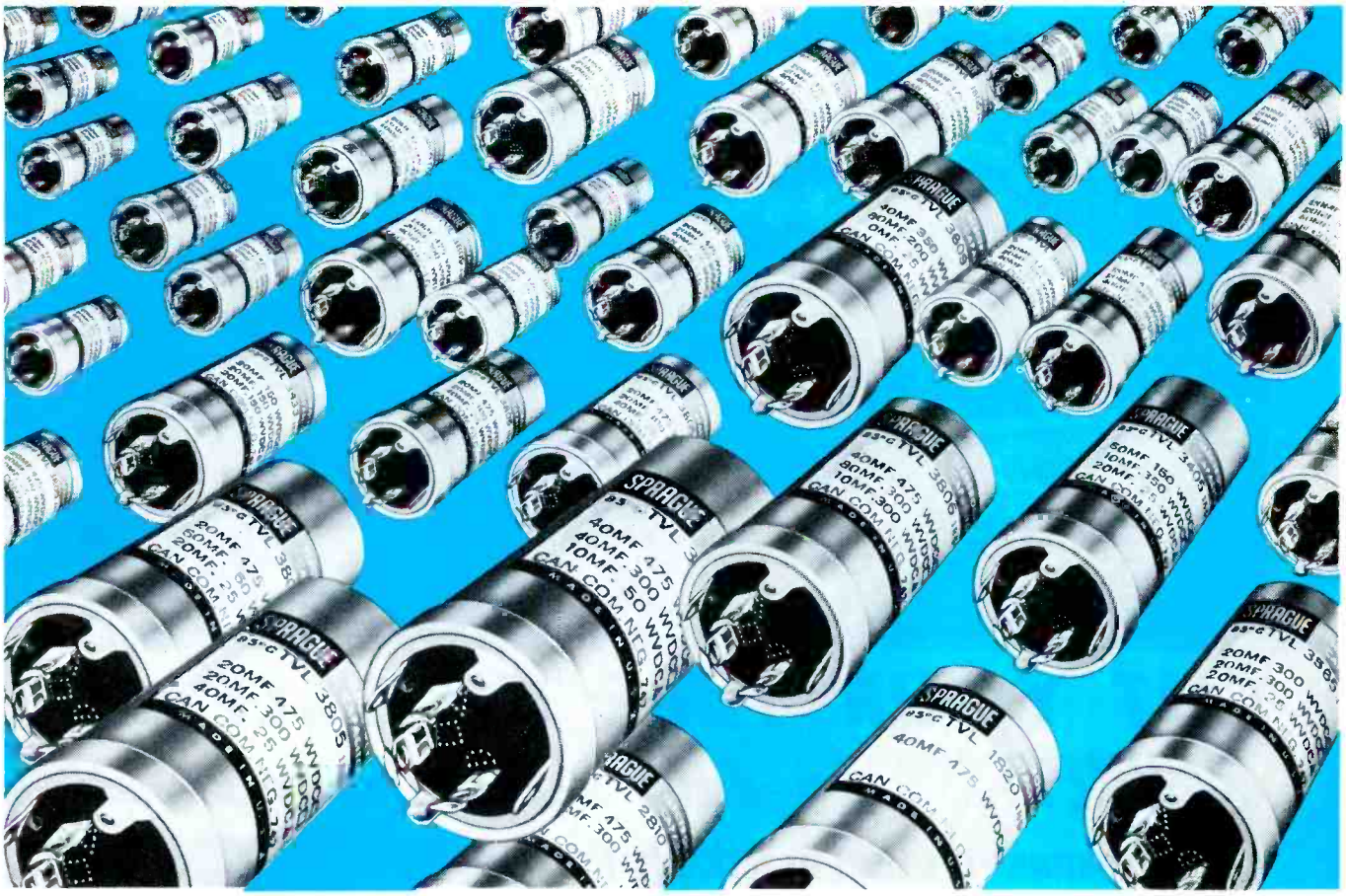
the magazine of electronic servicing

VOLUME 16, NO. 9 SEPTEMBER, 1966

CONTENTS

About the Cover

The repairman is testing one of the latest Hi-Fi consoles. The 1967 lines of Radios and phonographs have now been shown, and the most striking feature shared by all is the absence of tubes. All new audio equipment and nearly all new radias are completely solid state. The article starting on page 36 has solid information on solid-state instruments.



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When you fool around with makeshift or "fits-all" capacitor replacements by substituting sizes and ratings, you leave yourself wide open for criticism of your work, you risk your reputation, and you stand to lose customers. With so much at stake, it just doesn't pay to use makeshifts when it's so easy to get exact replacement capacitors from your Sprague distributor.

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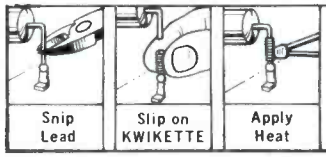

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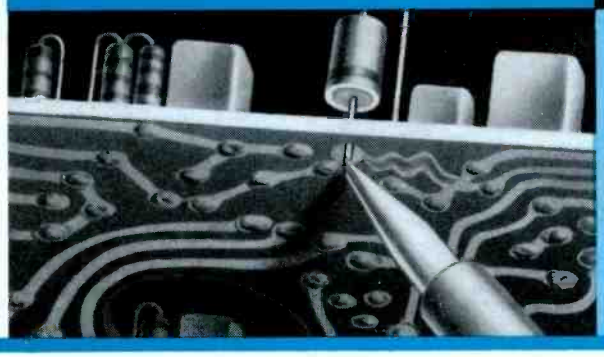
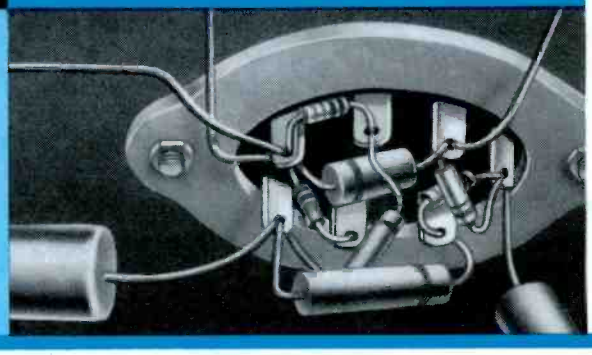
Circle 3 on literature card

Did you ever...

...lift a wire-lead component from a printed wiring board for testing ?



...test or replace a capacitor or resistor on a crowded tube socket ?



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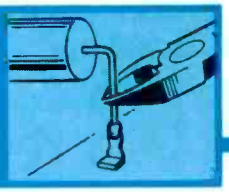
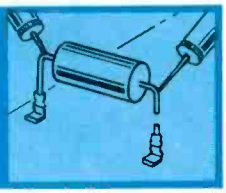
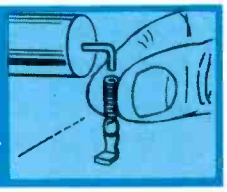


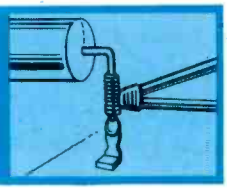
TEST...



SLIP ON KWIKETTE...



APPLY HEAT!



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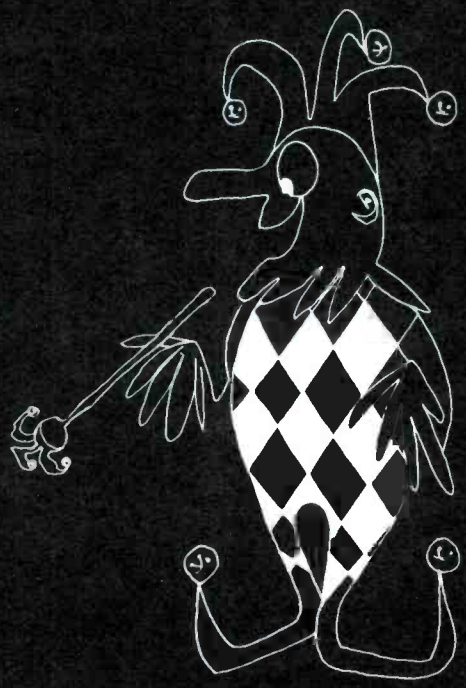

Here's the most foolproof volt-ohm-milliammeter ever made. Protection approaches 100%. It's the VOM you will want to have on hand where inexperienced people are running tests . . . or will reach for yourself on those days when you're all thumbs. The 260-5P will save you all kinds of headaches from burned out meters and resistors, bent pointers, and inaccuracies caused by overheating.

Combined Protection You Won't Find In Any Other VOM

1. Reset button pops out to indicate overload.
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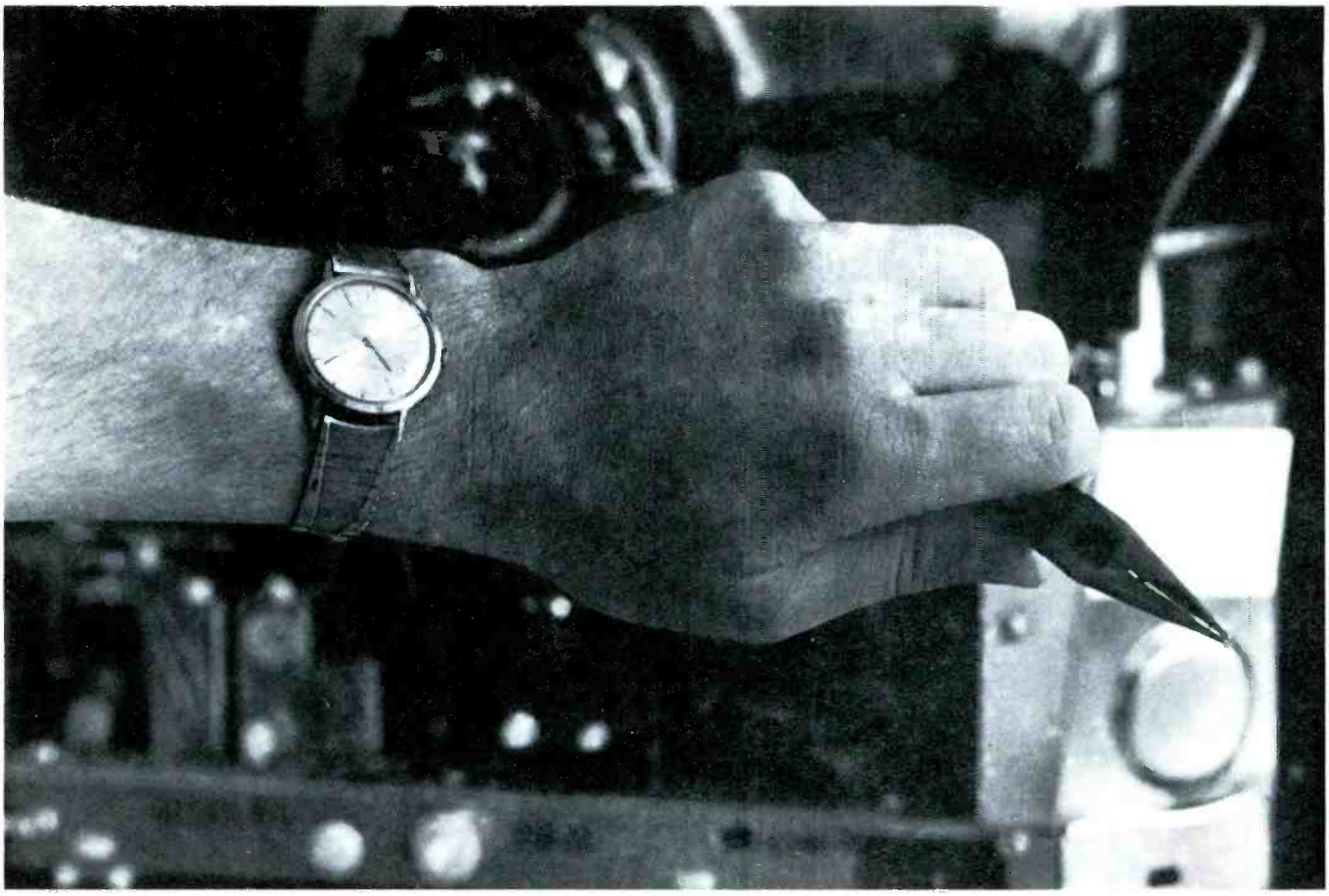
WORLD'S LARGEST MANUFACTURER OF ELECTRONIC TEST EQUIPMENT

Circle 5 on literature card



Are you a watch watcher?

If not, you should be.

After all, your time is what you're selling. So when it runs short, you feel it first in the pocketbook.

That's where Amphenol comes in. Our test equipment can't put more hours in your day, but it can help you handle more jobs every working hour—in the home or in the shop.

Take our Color Commander, for example. It cuts color alignment time by 40%. Here's how:

1. An exclusive three-color bar test pattern means you don't have to waste time counting unnecessary color bars. You check only the three bars required for color alignment.
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3. Another Amphenol exclusive: A single dot provides fast static convergence. You don't have to guess which is the center dot.
4. Single cross bar centers the raster quickly, conveniently.

These are the kinds of time-saving features you can expect from Amphenol's exciting line of test equipment —including the revolutionary CRT Commander and the hand-held Signal Commander.

If your time is important, you're ready for Amphenol.

For a brochure on the complete Amphenol line, call your Amphenol distributor. Or write to Amphenol, Box 134, Broadview, Illinois 60653.

BE ON THE LOOKOUT . . . for an exciting addition to the Amphenol line.

Completely solid state, the Amphenol Color Commander is available with battery power or built-in 117 VAC. Only 3½ lbs, it has RF and video output plus easy-to-use gun killers.

AMPHENOL™

Circle 7 on literature card

The Electronic Scanner

news of the servicing industry

Keeping Abreast

The nation's television servicemen were urged to "retread yourself as often as necessary just like the physician or engineer" to keep pace with new developments in consumer electronics.

The advice came from Paul B. Garver, General Manager, **RCA Parts and Accessories,** in the keynote address at the Tri-State Council of the Television Servicemen's Association's Telerama 66 convention. Approximately 250 independent servicemen and their wives from New Jersey, Delaware and Pennsylvania were present.

"The consumer appreciates the improved performance of products using new techniques," Mr. Garver said. "He is equally appreciative of the serviceman who understands, accepts and can repair the product using the newest developments."

Mr. Garver said he was referring to such new developments as circuit boards and integrated circuits.

"The introduction of new techniques into the manufacture of television sets has not reduced the demand for qualified service technicians," he said. "The increase in use of television sets has placed a demand on technicians. This demand has far overshadowed any reduction in service caused by the improved reliability.

"There is no need to fear progress. The only thing that progress requires of us is that our personal progress keep pace—You can do more to create a distorted image in the mind of your customer by knocking progress than in any other way."

He pointed out that manufacturers such as RCA "spend a lot of time and money to make training sessions available to you so that you can be kept current on the new developments. It is extremely important that you avail yourself of every opportunity to learn."

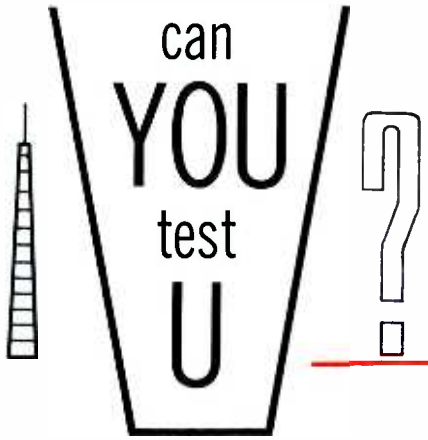
He cited six characteristics of a successful serviceman —dependability, quality consciousness, a professional appearance, flexibility and willingness to accept change, capability and honesty.

"Be honest with your customers and honest with yourself," Mr. Garver concluded. "Make sure you are making an honest and reasonable profit in your business and you will create the kind of image that will last."

DeVry Merges

In the next decade, America's industrial economy will require more than one million new technicians to fill its manpower needs, **Bell & Howell** president Peter G. Peterson said in announcing plans to merge **DeVry Technical Institute, Inc.,** a Chicago-based electronics training organization, into Bell & Howell Company.

• *Please turn to page 66*



by Larry Allen

Thirty million all-channel TV receivers will be in service this year, and all will need attention sooner or later. Thus each of the 100,000 service technicians throughout the nation will average 300 service calls —almost one per day. Since not all UHF-VHF receivers are in UHF areas, the number being installed and serviced by "VHF-only" technicians is considerable.

In either type area—VHF, UHF, or both—tests in front of the VHF tuner are a necessity if the servicing job is to be done thoroughly. In a VHF-only area, the UHF tuner may be ignored. But what if your customer moves, or a commercial or educational UHF station opens up nearby before you see the set again, or the family takes the all-channel portable along on vacation? You should at least have checked to insure that the UHF tuner is functioning.

Four Systems of Testing Receivers

The obvious way to test UHF front ends is with a UHF station signal. But, just as obviously, this can be done only in a UHF signal area. Therefore, you should know just what tests to make and what to watch for.

Another method of testing UHF receivers is either to buy test equipment designed specifically for UHF frequencies or modify existing generators so they will develop a UHF output signal. Test instruments for UHF differ from ordinary VHF instruments only in their output RF frequencies. VHF channels range from 54 mHz through 220 mHz; UHF extends from 470 mHz through 890 mHz. The video and other test information imposed on the UHF output signals are the same as for VHF. In some alignment generators, enough harmonics are generated to permit their use in testing UHF receivers.

A third system is becoming popular because of its versatility. It consists of converting ordinary VHF signals from generators or stations to UHF frequencies by means of translators, instruments that use a heterodyning method something like a converter in reverse. The attractiveness of this system is that you can use all your regular VHF-signal-generating instruments, merely feeding any of them into the translator and connecting the translator's UHF output directly to the UHF tuner in the receiver. The system requires that you buy only the translator; the other units require no changes or modifications.

The fourth testing system is more accurately termed a procedure. It is a hybrid method, utilizing ordinary VHF test instruments to check out the receiver from VHF tuner input to picture tube and speaker, but using a plain UHF RF generator to check for proper conversion in the UHF tuner. This method does not reveal much about a tuner's bandwidth characteristics (and these are important), but it is one way to get a reasonably reliable idea of how well the UHF tuner is working.

UHF Station Signal

All modern UHF tuners are of the continuous-tuning type. Therefore, you should check their dial accuracy — stations should appear near their dial markings. This is not critical except near the limits

of the dial, but you may get a call-back if you return a newly repaired set with the front-end frequency very far off. At either end (channels 14, 15, or 16 and channels above 70) you could lose one or more channels if the oscillator doesn't track the dial properly.

Before returning the oscillator, make sure the dial pointer itself is lined up so that it indicates evenly at both ends when the knob is turned to its limit stops. Then, for checking, choose channels near the middle of the band if you have them. With some tuners, precise tracking is impossible; one station may be off a few divisions when the oscillator tank is adjusted for accuracy on another. Try to obtain a compromise between them.

Testing an all-channel receiver beyond the UHF tuner is merely a matter of using the same techniques you use with VHF sets. One interesting point: If you are in an all-UHF area, be sure to check the VHF tuner; some sets feed the UHF tuner output directly into the IF strip, using the VHF tuner only for VHF reception, while others use the VHF tuner as an IF preamplifier during UHF operation. If you don't have a VHF station, you'll have to resort to VHF test generators for a signal.

Special UHF Instruments

You will not find many instruments with output frequencies in the ultrahigh range, not at a price you can afford. Some manufacturers build precision signal generators for this band of frequencies, but their cost is usually high; it's hard to justify spending a large amount for an instrument ordinarily used only for perfunctory checks.

A satisfactory compromise has been reached by certain makers of test equipment — they add a UHF oscillator to their instrument, thus making it a UHF-VHF design. This U-V design has been used in a couple of recent field-strength meters, which we'll discuss later. Certain other VHF test units can be converted for UHF with modification kits designed by the manufacturer. Before you spend dollars on expensive special test equipment, check with the builder of instruments you now own. There may be a kit that can be used to convert your present instrument. At the very least, the manufacturer can tell you whether modification is at all feasible.

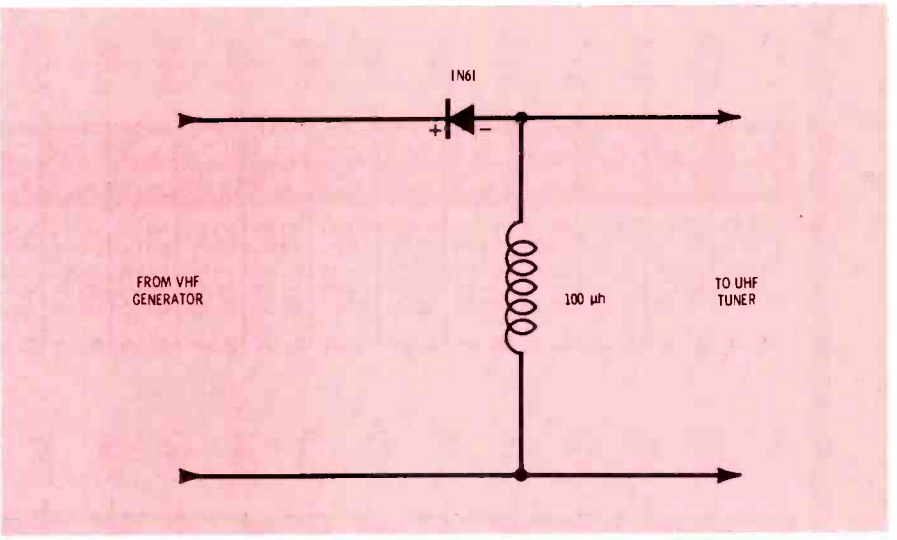


Fig. 1. Simple harmonic generator.

In signal generators, it is often possible to use harmonics to check out UHF tuners. For example, the third harmonic of VHF channel 8 falls near 555 mHz, which is UHF channel 27. The third harmonic of channel 13 falls at channel 42. Even the fourth harmonic can sometimes be used, as in the example of channels 13 and 77, or channels 8 and 57. Be careful, however; some generators reach their topmost ranges through the use of harmonics; harmonics of a higher order may be too weak and unstable to be usable. The chart in Table 1 shows the various channel frequencies; use it to find other harmonic relationships.

If your generator has low harmonic content but strong output signals in the VHF range, you can add a diode-coil combination as in Fig. 1 to increase harmonic output. Keep in mind, however, that you are drastically cutting down the amount of signal. Be sure there is enough left to do the job.

Fig. 2 shows how the harmonic output of a sweep generator can be increased in the UHF band, using a piece of transmission line cut to length. To find the correct length in inches, use Table 1: Divide 2950 by the UHF frequency (in mHz) you will use most. Thus, for low channels, slightly more than 6″ is acceptable; for channel 44 and thereabout—4.5″; for channel 76 —3.5″. Be sure the stub is shorted.

Small Translators

UHF converters are well known; they change UHF signals to VHF

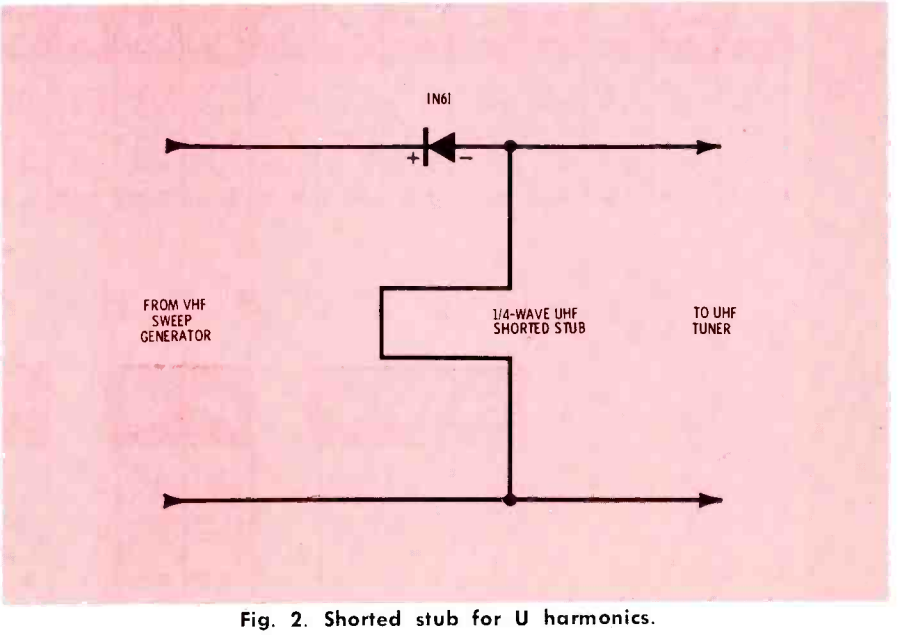


Fig. 2. Shorted stub for U harmonics.

TELEVISION CHANNEL FREQUENCIES

Knowledge of specific frequency allocations within the television spectrum can be most helpful to the technician, engineer and student. As a handy reference guide, the PF REPORTER staff has prepared this guide, which shows the frequency limits and carrier frequencies for channels 2 through 83.

P = PICTURE CARRIER FREQ. (MC)
S = SOUND CARRIER FREQ. (MC)

CHANNEL NUMBER	P	S	FREQ. LIMITS OF CHANNEL (MC)
2	55.25	59.75	54–60
3	61.25	65.75	60–66
4	67.25	71.75	66–72
5	77.25	81.75	76–82
6	83.25	87.75	82–88
7	175.25	179.75	174–180
8	181.25	185.75	180–186
9	187.25	191.75	186–192
10	193.25	197.75	192–198
11	199.25	203.75	198–204
12	205.25	209.75	204–210
13	211.25	215.75	210–216
14	471.25	475.75	470–476
15	477.25	481.75	476–482
16	483.25	487.75	482–488
17	489.25	493.75	488–494
18	495.25	499.75	494–500
19	501.25	505.75	500–506
20	507.25	511.75	506–512
21	513.25	517.75	512–518
22	519.25	523.75	518–524
23	525.25	529.75	524–530
24	531.25	535.75	530–536
25	537.25	541.75	536–542
26	543.25	547.75	542–548
27	549.25	553.75	548–554
28	555.25	559.75	554–560
29	561.25	565.75	560–566
30	567.25	571.75	566–572
31	573.25	577.75	572–578
32	579.25	583.75	578–584
33	585.25	589.75	584–590
34	591.25	595.75	590–596
35	597.25	601.75	596–602
36	603.25	607.75	602–608
37	609.25	613.75	608–614
38	615.25	619.75	614–620
39	621.25	625.75	620–626
40	627.25	631.75	626–632
41	633.25	637.75	632–638
42	639.25	643.75	638–644
43	645.25	649.75	644–650
44	651.25	655.75	650–656
45	657.25	661.75	656–662
46	663.25	667.75	662–668
47	669.25	673.75	668–674
48	675.25	679.75	674–680
49	681.25	685.75	680–686
50	687.25	691.75	686–692
51	693.25	697.75	692–698
52	699.25	703.75	698–704
53	705.25	709.75	704–710
54	711.25	715.75	710–716
55	717.25	721.75	716–722
56	723.25	727.75	722–728
57	729.25	733.75	728–734
58	735.25	739.75	734–740
59	741.25	745.75	740–746
60	747.25	751.75	746–752
61	753.25	757.75	752–758
62	759.25	763.75	758–764
63	765.25	769.75	764–770
64	771.25	775.75	770–776
65	777.25	781.75	776–782
66	783.25	787.75	782–788
67	789.25	793.75	788–794
68	795.25	799.75	794–800
69	801.25	805.75	800–806
70	807.25	811.75	806–812
71	813.25	817.75	812–818
72	819.25	823.75	818–824
73	825.25	829.75	824–830
74	831.25	835.75	830–836
75	837.25	841.75	836–842
76	843.25	847.75	842–848
77	849.25	853.75	848–854
78	855.25	859.75	854–860
79	861.25	865.75	860–866
80	867.25	871.75	866–872
81	873.25	877.75	872–878
82	879.25	883.75	878–884
83	885.25	889.75	884–890

signals without altering the video-and-sound content. The resulting signal can be fed to a set that doesn't have an all-channel tuner.

At least one test-equipment builder (see "Notes on Test Equipment" in the April 1966 PF REPORTER) has come up with the converter idea in reverse! You feed in a VHF signal and out comes a UHF signal. The popularity of this system stems from the fact that the input VHF signal can come from any signal-generating device—station, modulated signal generator, flying-spot scanner, or sweep generator. Thus, with a single instrument, you can put any of your regular test equipment to work when you need to check a UHF tuner.

With a translator and a good VHF signal, you can check overall alignment, make sure bandwidth is normal, and get a reasonably accurate idea of how well the dial tracks. You can align the IF strip and front end (including UHF) with your standard sweep generator. By feeding in a converted VHF video signal, either from the station or from a video generator, you can determine whether the UHF tuner degrades the signal in any way. Since the output dial of the translator is continuously tunable and reasonably accurate in calibration, you can check dial tracking of the tuner at any frequencies you wish. This last capability is especially helpful if you are servicing a UHF tuner that will receive some stations but not others—a common trouble.

Certain simple UHF converters, with only an oscillator and a crystal mixer, can be wired up backward to achieve this "reverse conversion." Fig. 3 shows how this is done. With modifications like this one, you cannot be sure of frequency accuracy, but it is one way to get a UHF test signal in an area where none is otherwise available.

Testing Without UHF

In this system, you use the VHF tuner of the receiver for all servicing and testing. When the set is working normally on VHF, you can be sure everything is correct through the IF strip and beyond; of course, you also know the VHF tuner is normal.

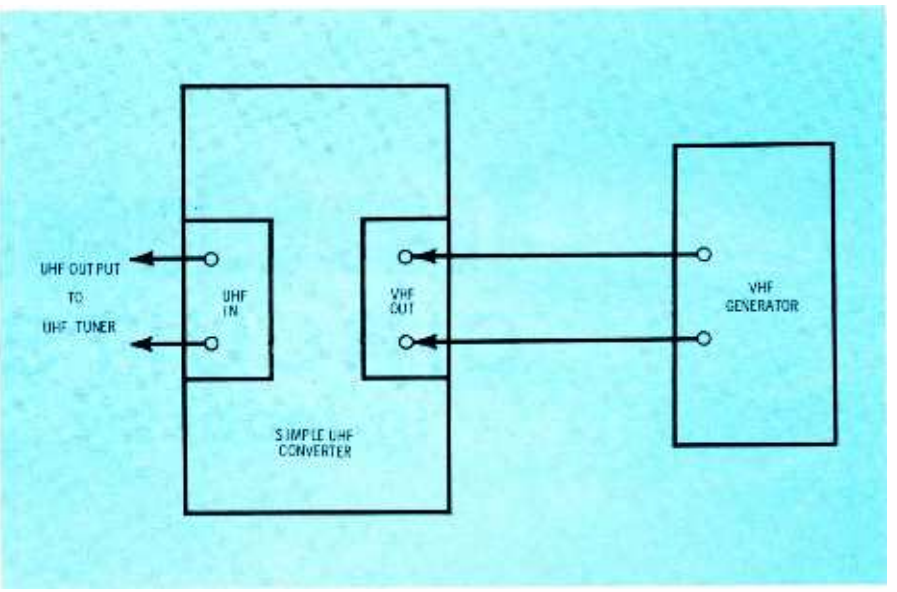


Fig. 3. Converter used as translator.

To check UHF operation, switch the set to UHF and run the dial through its range. There are certain points at which you get slight blips as you tune past them. These are caused by harmonic interrelationships between the set's own oscillator(s), and indicate only that the UHF oscillator is working at that point on the dial.

If you have a fairly good signal generator, you can generally get enough harmonic output to show slight blips or herringbone patterns at different points on the tuner dial, even though such signals are not strong enough for any serious servicing. Furthermore it is difficult to calibrate the tuner dial from this kind of testing; therefore, you'll just have to omit that without checking. At least, you can assure your customer the UHF tuner is functioning.

Finding the UHF Signal

Important in all UHF areas are the antennas, as we pointed out in "12 Years of UHF" in the December 1965 issue of PF REPORTER. To orient them properly, and in some dead spots to find a signal at all, a field-strength meter is almost a necessity. Naturally, the FSM must be able to receive UHF signals.

There is more than one UHF-VHF field-strength meter available now, in the price range a service technician can afford. Others are in the design stages and wil be available soon, although some are precision instruments that will stretch the pocketbook of many service shops. (Another method of orienting UHF antennas has been the use of UHF receivers. Modern portables, transistorized and with self-contained battery power supplies, lend themselves readily to such use.)

If you have a VHF-only field-strength meter, explore the possibility of converting it (see "Converting FSM's to UHF" in the March 1964 issue of PF REPORTER). Or if, it doesn't convert readily, consider the possibility of using it with one of the small translators described earlier. If you are going to buy a translator for other UHF servicing anyway, you might as well use it for this, too.

Conclusion

You can test all-channel receivers from front end to picture tube with little more than your normal complement of test instruments. It is not necessary to spend a large amount of money on precision UHF generators merely for the sake of getting a UHF oscillator aligned accurately. If you are in a UHF area, you can check the dial with station signals; if you're not, such accuracy possibly isn't needed because your customer may not be watching UHF regularly.

However, you should check out the UHF tuner in some manner in every all-channel set you service. Otherwise, you aren't doing a really complete servicing job. You can test U! ▲

Transducer CIRCUITS In Industry

by William Nelson

The operation of many machines and all electrical measurements depend on the ability of some type of sensing element or conversion device, called a transducer, to detect the physical actions and to convert this information for use in another system. Such transducers may operate in direct contact with the object whose properties are being sensed or measured; or they may operate at some distance from the source of the action.

Many different kinds of transducers are used throughout industry for sensing, measuring and controlling temperature, humidity, acceleration, rotary and linear motion, pressure, speed, and many other actions. The development of new and improved transducers has played an important role in extending electronic techniques to new and improved industrial processes.

Transducers are not mysterious devices. One of the best known in the TV shop's operations is the phonograph cartridge. This device converts the movement of the stylus into electrical currents. Another familiar device is the LDR used in Automatic Brightness Control, which enables the TV picture's brightness to vary with illumination in the room.

With a proper understanding of the principles involved, service technicians can prepare to add industrial electronics to their field of operations.

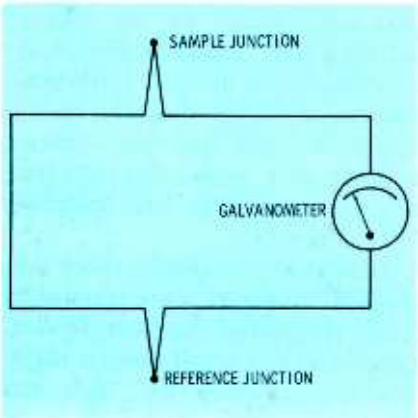


Fig. 1. Basic thermocouple circuit

Temperature

The most common methods of sensing temperature are based on one of three principles: (1) fluid expansion, as in mercury-in-glass thermometers; (2) the generation of a voltage, as in the thermocouple; and (3) a resistance change with temperature, which is the basis for a resistance/temperature transducer.

The use of the thermocouple is based on the discovery (by Thomas Seebeck in 1821) that electric current flows in a closed circuit of two dissimilar metals if their junctions are at different temperatures. A thermocouple may be used to measure temperature with the simple circuit of Fig. 1. The instrument is calibrated so that a known voltage results from a specific temperature. The reference junction is kept at a precise and constant temperature. One of the simplest methods is to immerse it in a bowl of ice and water. The melting ice keeps the water at 32° F.

Operation of a resistance thermometer is based on the fact that the electrical resistance of materials varies with temperature. Resistivity of most metals increases with increased temperature. Resistivity of electrolytes, semiconductors, and insulators decreases with increased temperature. A resistance thermometer consists of such a resistance element, a resistance measuring circuit, and an indicator. The resistance measuring circuit is usually a Wheatstone bridge as indicated in Fig. 2.

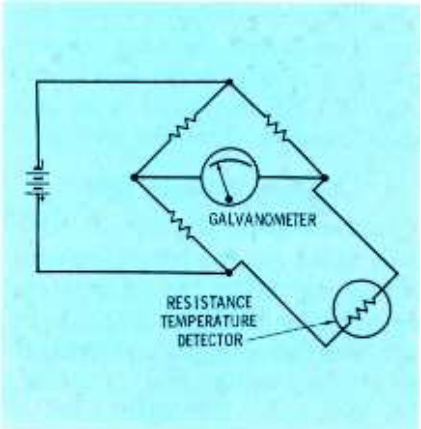


Fig. 2. Circuit for thermistors.

Pressure

The main requirement of a pressure transducer is that it will make measurements over the expected range of pressure, while remaining shock and vibration resistant.

One pressure transducer which meets these requirements is shown in Fig. 3. The transducer here is called the Equibarr, a differential capacitance device consisting of a tightly stretched stainless steel diaphragm clamped between two discs. Capacitor electrodes are formed on concave surfaces of the discs, adjacent to the diaphragm. The two capacitances form two arms of an AC bridge. The bridge is driven by an oscillator which also furnishes a reference signal to a phase detector.

When input pressures on both sides of the Equibar diaphragm are equal, the bridge is balanced and no output results. Any pressure difference causes an unbalance of the bridge, with a corresponding output signal. This signal is amplified and fed into a phase-sensitive circuit, which drives a panel meter and provides a proportional DC output voltage for driving a recorder. A portion of the amplifier output is also brought out directly for use with AC devices in measuring high-speed pressure changes.

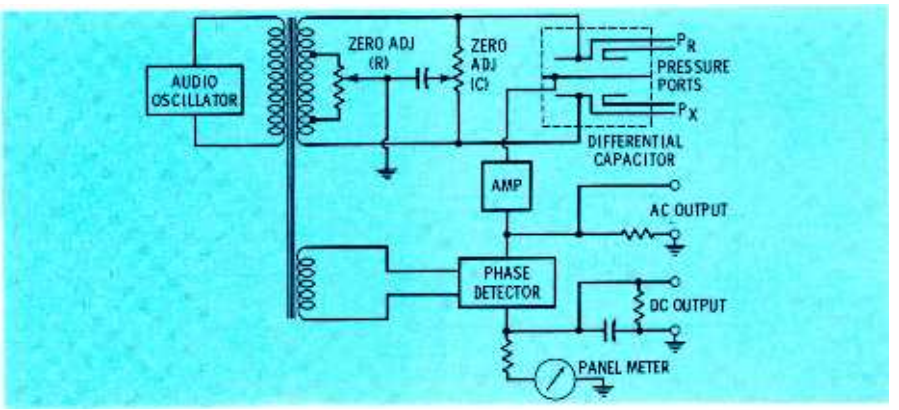


Fig. 3. Equibar® method of pressure measurement.

Displacement

Many requirements exist for translating linear or rotational displacement or force into an electrical signal. Although many transducers have been developed for measuring such force, performance and environmental requirements necessitate continued improvements in displacement measuring techniques.

One sensitive transducer for measuring displacement is the vacuum tube, RCA type 5734. This tube takes advantage of the effect known as microphonics. Small displacements of the electrodes can be measured with a bridge circuit such as that in Fig. 4.

The tube's cathode and grid assembly are held in a fixed position within a vacuum-tight envelope; the anode is supported by a rod which extends through the center of a thin metal diaphragm sealed to the tube envelope. Any angular displacement of this rod leads to variation of the plate current, which is indicated on a plate current milliammeter calibrated in displacement or force.

Torque

Need often arises to measure torque, such as the starting or running torque of a motor. Torque is a product of force times distance; thus, any force-measuring transducer becomes a torquemeter when combined with a distance measurement.

A magnetostrictive torquemeter measures force and distance simultaneously, with the added advantage of sensing the direction as well as magnitude of the torque. Magnetostriction is exhibited by a ferromagnetic material: it changes length when magnetized and, conversely, changes its magnetic permeability when its length is changed. If a ferromagnetic rod is used as the core of a differential transformer (as in Fig. 5), it will serve as a torquemeter.

Under conditions of zero torque, the output of the secondaries of the differential transformer is zero. When torque is applied to the ferromagnetic rod, the relative coupling between the primaries and secondaries changes. The output to the meter is the vector difference between the two secondary outputs and, as such, is a function of torque. When the direction of the torque is reversed, the output also reverses.

Strain

Many modern devices must be designed to withstand a certain amount of strain or stress under operation. To measure this strain, some type of gauge is used.

When a filament of semiconductor material is subjected to mechanical strain, its resistivity undergoes an appreciable change, which is a measure of the strain applied. This strain gauge is usually connected as part of a Wheatstone bridge, as indicated in Fig. 6. Strain-gauge elements may comprise one, two, or all four arms

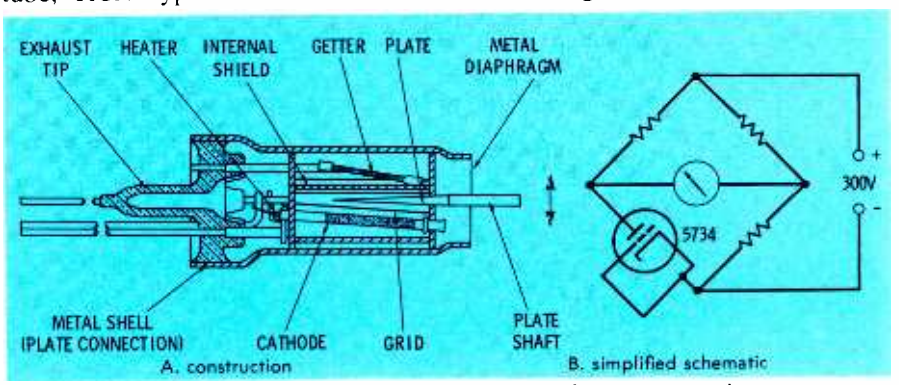


Fig. 4. Displacement measurement with type 5734 tube.

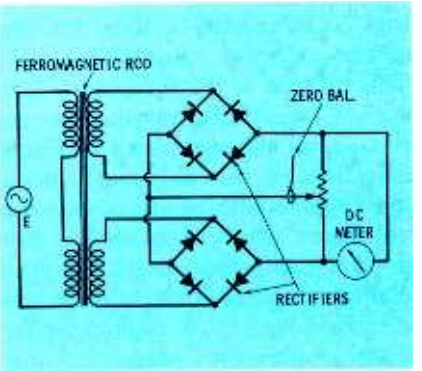


Fig. 5. Magnetostrictive torquemeter.

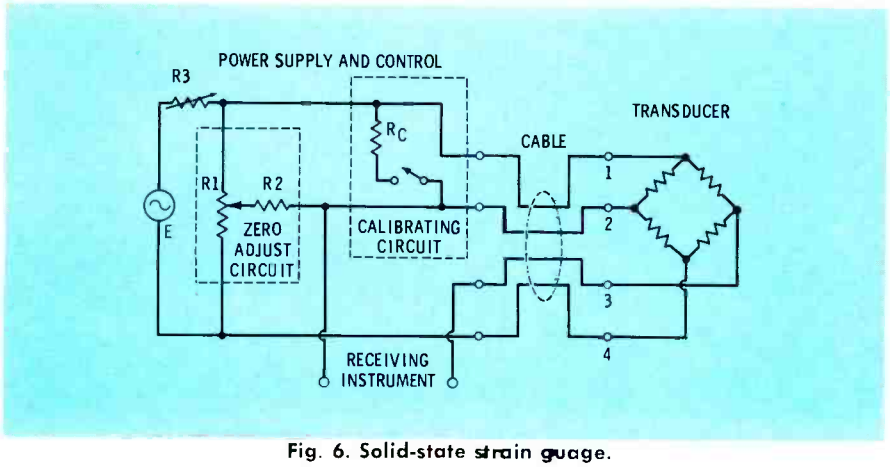


Fig. 6. Solid-state strain gauge.

of the bridge. The bridge is usually arranged so that it is balanced when zero strain is being applied.

If any of the semiconductor elements experience a stress, the elements are deformed, causing their resistance to change and the bridge to be unbalanced. An output voltage, proportional to the magnitude of the stress, appears at the terminals of the bridge. This voltage may be used to drive a galvanometer directly or a DC amplifier followed by a meter, which then serves to indicate the magnitude of the strain.

Rotary Speed

Many applications of rotating machinery require the measurement of RPM, which makes necessary a sensitive transducer for measuring rotary speed. A capacitive transducer offers an accurate tachometer for this task. The capacitor is formed by a metallic stator plate and a rotor plate. The rotor plate is attached to the shaft of the rotating machinery. The capacitor has maximum capacitance for a particular shaft position and minimum capacitance 180 degrees away.

With the capacitor excited by an AC signal, a sensitive impedance measurement circuit, such as that of Fig. 7, can be used to detect rotation of the capacitor rotor plates, $\triangle C$. This rotation of the plates modulates the AC signal by varying the impedance of the capacitors. A simple detection of the amplitude modulated signals thus produced provides an output whose frequency is proportional to rotary speed; the modulation amplitude is relatively constant with speed. A counter or frequency meter then reads out rotary speed.

Liquid Level

Continuous inflight measurement of liquid fuel in space boosters has become increasingly important. Such measurements insure maximum propellant utilization and weight distribution within the rocket, as well as proper functioning of the fuel pumps. Digital input to a telemetry system is also desirable since it will virtually insure no loss of accuracy in the measurement during transmission and data handling.

The liquid-level sensing system of Fig. 8 is based on determining the ratio of two capacitances, C_R and C_S, so that the system has a binary (two valued) digital output. Any change in liquid level causes unbalance in the capacitance bridge. An electronic counter then rebalances the bridge by switching into (or out of) the bridge the appropriate capacitances, in digital binary steps. When balance is restored, the counter supplies a parallel digital output corresponding to fuel level. ▲

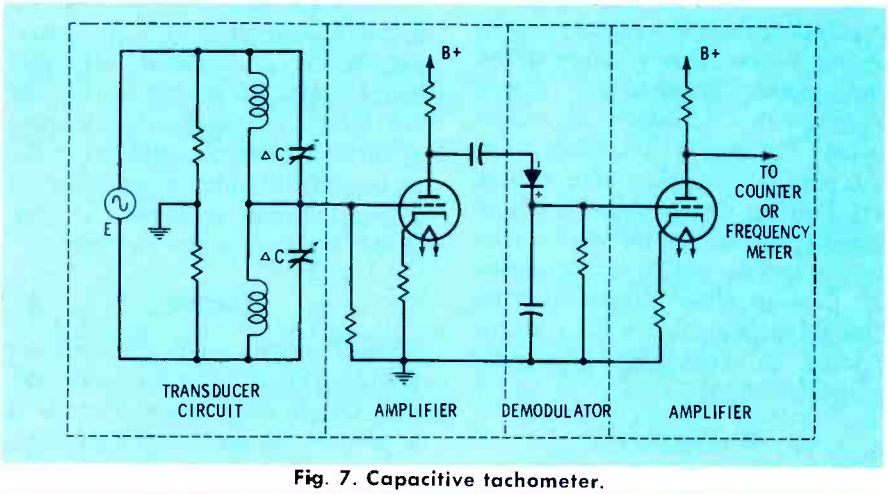


Fig. 7. Capacitive tachometer.

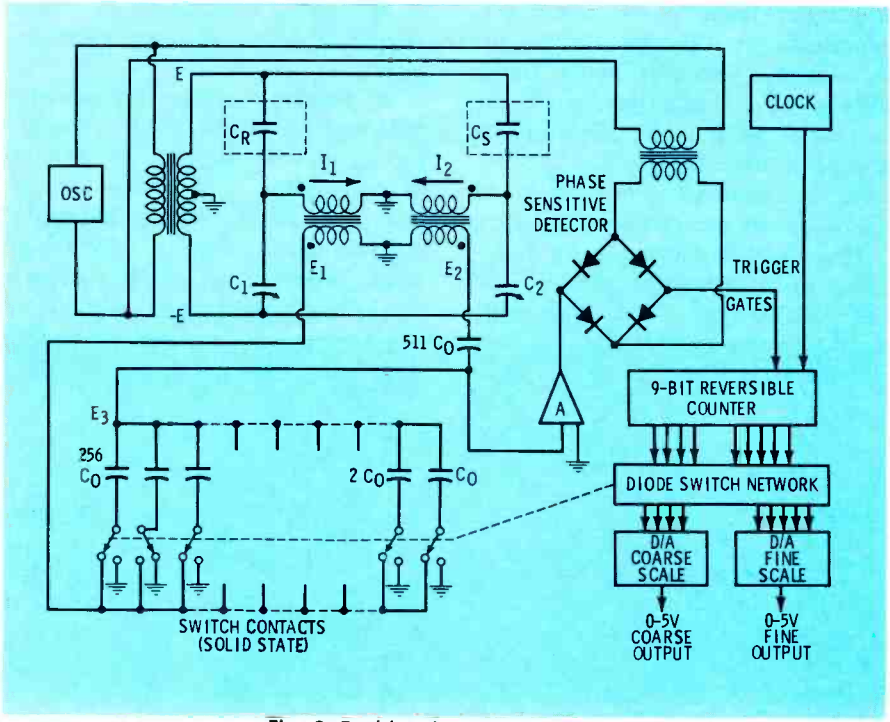


Fig. 8. Fuel-level monitoring circuit.

What New Legislation Means to You

Regulations and laws that affect the employer.

by Ralph M. Scott

Income Tax Changes

The Adjustment Act of 1966 effects a change in income tax to be withheld from the wages of individual taxpayers, effective May 1, 1966. According to the **Employer's Tax Guide,** published by the Internal Revenue Service, this change is not an increase in taxes withheld, but is a system designed to make the total tax withheld coincide more closely with the annual tax owned.

Effective May 1, the new system provides for six graduated rates, ranging from 14% to 30%, superseding the flat 14% withheld under old legislation. There are two separate rate schedules: (1) single persons and heads of households, and (2) married persons and surviving spouses.

Because of changes made by the new 1966 Act, each employer should obtain from the nearest office of the Internal Revenue Service a copy of IRS Publication No. 15 (Rev. April 1966). This publication explains in detail the employer's requirements in withholding income tax and social security payments. It also contains tax tables showing the amount of payments compatible with wages earned by the employee in the separate rate schedules.

It is not the intent of this article to rehash the detailed instructions set forth in the IRS publication. However, for the convenience of readers who are employers, listed below is a summary of the calendar of employers' duties with regard to income tax and social security.

1. **On hiring new employees:** For income tax purposes, ask each new employee for a withholding exemption certificate on Form W-4. For social security, record the account number and name of the new employee from his social security account number card. If he has not previously applied, or has lost his card, have him file an application on Form SS-5.

2. **On each payment of wages to an employee:** Withhold income tax from each wage payment in accord with the employee's withholding exemption certificate and the applicable withholding rates. For social security taxes, withhold 4.2% from each wage payment on the first $6600 of annual wages.

3. **By the 15th day of each month:** After each of the first two months of each quarter, deposit both income tax withhheld and employee and employer social security taxes for such month, if the total is more than $100, in any commercial bank qualified as a depositary for federal taxes, or in a Federal Reserve Bank. Tax for the third month of any quarter may either be deposited or paid with the quarterly return.

4. **On or before each April 30, July 31, October 31, and January 31:** File a quarterly return on Form 941 with the district director of Internal Revenue and pay the full amount of taxes due for the previous quarter on both income tax withheld from wages and employee and employer social security taxes.

5. **Before December 1 of each year:** Request the filing of a new certificate, Form W-4, by each employee whose withholding exemptions will be different in the next year from those shown on his last certificate.

6. **On or before each January 31 and at end of employment:** Give each employee a withholding statement in duplicate on Form W-2, showing (1) the amount of social security tax withheld and the amount of wages subject to this tax; (2) the amount of income tax withheld, total wages, and other compensation; and (3) the amount of unpaid employee tax on tips, if any. If Form W-2 is not required, give the statement of social security wages and employee tax deducted.

7. **On or before January 31 of each year:** File Form W-3, Reconciliation of Income Tax Withheld from Wages, together with all district directors' copies (Copy A) of wage and tax statements furnished employees on Form W-2 for the preceding calendar year. For Federal Unemployment Tax Act (FUTA), file annual return on Form 940 and pay full amount due.*

* **Employer's Tax Guide,** Internal Revenue Service Publication 15 (Rev. April 1966) p. 2.

Social Security

The Social Security Amendments of 1965 increased the tax contribution of individuals to 4.2% of the first $6600 of the worker's earnings — or payment up to a maximum of $277.20 annually. Previously, from 1959 through 1965, the tax was computed on the first $4800 of the worker's earnings. Workers who earn less than $6600 per year will pay a proportionately less tax. These tax deductions—and matching payments by employers—plus payments by the self-employed finance monthly payments and disability benefits to workers and their families, and to survivors when the worker dies.

In addition to increasing tax payments, and benefits as well, the Amendments of 1965 provide hospital insurance for all persons at age 65 and optional medical insurance under the new "Medicare."

Medicare: Hospital Insurance

The Medicare program provides for two different kinds of health insurance for persons 65 or older. First, hospital insurance is available to all eligible persons and is financed out of payments made under social security. Persons who were 65 or older on January 1, 1966, must apply for this insurance in order to start receiving benefits in July 1966. Persons who reach 65 later will become recipients automatically. This hospital insurance is designed to help pay bills when the individual is hospitalized. The program also provides payments for skilled nursing home care and other services in an extended-care facility after hospitalization, outpatient hospital diagnostic services, and home health services. Specifically, beginning in July 1966, the hospital insurance plan will pay the cost of covered services for the following hospital and posthospital treatment and care:

1. Up to 60 days in a hospital (except for the first $40) and all but $10 per day for an additional 30 days during each spell of illness. (A "spell of illness" begins on the first day the individual receives covered services in a hospital; it ends after he has been out of a hospital or extended-care facility for 60 consecutive days.) There is a lifetime limit of 190 days in mental hospitals.

2. Up to 20 days in an extended-care facility (such as a skilled nursing home or convalescent section of a hospital which meets the requirements of the law) and all but $5 per day for an additional 80 days for each spell of illness. Services in an extended-care facility are covered only if the individual has stayed in a hospital for at least 3 days, and only if he enters the extended-care facility within 14 days after leaving the hospital. (This portion of the program is effective Jan. 1, 1967.)

3. Up to 100 home visits by nurses or other health worker from a home health agency (not doctors) in the 365 days following the person's release from a hospital (after a stay of at least 3 days) or from an extended-care facility.

4. Eighty percent of the cost of outpatient diagnostic tests in a hospital (after the first $20) for each 20-day period of diagnostic testing.

Services covered in a hospital or extended care facility include the cost of room and board in semiprivate accommodations, ordinary nursing services, and cost of drugs, supplies, and most other items of service furnished for patients in hospitals and extended-care facilities.

Medical Insurance

The second kind of insurance provided in the Medicare program is medical insurance. This insurance, unlike health insurance, is voluntary. Beginning in July 1966, those persons 65 or over who desire to have medical insurance must pay $3 per month, to be matched by a like amount from the Federal Government. This monthly cost may become higher in the future, depending upon the total cost of the program as it develops.

Beginning in July 1966, the medical insurance will provide the participant assistance in paying for the following medical services:

1. Physicians' and surgeons' services in the hospital, doctor's office, home, or elsewhere. The individual may choose his own doctor.

2. Up to 100 home health visits under an approved plan each year with no need for prior hospitalization. This is in addition to the 100 visits provided under the hospital insurance program.

3. Other medical and health services, such as diagnostic services, X-ray or other radiation treatments, surgical dressings, splints, casts, and rental of medical equipment.

In each calendar year, the medical insurance plan pays 80% of the remaining reasonable charges for the above services after the individual has paid the first $50. For example, if the total annual medical charges are $200, the individual will pay $50, leaving a balance of $150. The insurance will then pay 80% of $150, or $120, leaving $30 for the individual to pay. Thus, if the individual has a $200 medical bill, he will pay $80. The insurance pays the remaining $120.

It should be noted that the hospital insurance alone does not cover the cost of physicians' and surgeons' services, including pathologists, radiologists, and anesthesiologists in the hospital. However, the optional medical insurance (at $3 per month cost) will help pay for these services.

Not covered under either program are these services: routine physical checkups, eyeglasses, hearing aids, private duty nurses, custodial care, and personal services such as telephones or TV sets in hospital rooms.

Under the hospital insurance plan, drugs are covered only when they are furnished to a patient in a hospital or extended-care facility. Under the medical insurance program, drugs are covered only when administered by a physician. They cannot be self-administered.

Social Security Benefits

As was stated, the two insurance programs, grouped under Medicare, are the results of the 1965 Congressional legislation. However, social security offers other benefits which are often not clearly understood by the employer or his employee.

To obtain cash benefits for himself or his family, or for his survivors to receive payments in event of his death, the worker must accumulate credit for a certain amount of work done under social security. This credit may have been accrued at any time after 1936. The amount of work required for payment is given in years. Actually, most employees get credit for one quarter-year of work if they are paid $50 or more in covered wages in a three-month calendar quarter. Four quar-

ters are counted for any full year in which a person has earned $400 or more in self-employment income or cash wages for farm work.

To be fully insured — that is, to gain maximum benefits—the worker must have worked under social security long enough to attain the prescribed credits. Just how much credit a man must have to be fully insured depends upon the year he reaches age 65 (62 for a woman). For example, to be fully insured, a man who reached 65 (or died) in 1957 or earlier needed to have worked 1½ years under social security. If he reached 65 in 1958, he needed credit for 1-¾ years. For each succeeding year, add ¼ year of credit. Thus, a man would need to have worked 2 years under social security to be fully insured if he reached 65, or died, in 1959. To illustrate the scale of credit years, to reap maximum benefits for himself (or for his survivors) a man would have had to work under social security for 3¾ years if he reaches 65 or dies in 1966. If he reaches 65 or dies in 1971, he would have had to have been under social security 5 years. Thus, for present day younger people, if a man reaches 65 or dies in the year 1991 or later, he will have had to have worked under social security 10 years. No one needs to work beyond ten years under social security to receive maximum benefits.

Old-Age Retirement Benefits

Under present law, monthly benefits are payable to retired male workers at age 65, and to female workers at age 62. Men may receive reduced benefits at age 62. Benefits may be paid to dependents as follows: a wife or dependent husband age 62 or over; children under 18, or up to 22 if in full time attendance at school; disabled children over 18 who became disabled prior to their 18th birthday; a wife at any age if she has children in her care.

Survivors' Benefits

Upon the death of an insured worker, monthly benefits are payable to a surviving widow, or dependent widower age 62 or over. A widow may elect to receive reduced benefits at age 60. Death benefits are also available to children under 18, or up to 22 if in full time attendance at school. Disabled children of any age may receive death benefits if they become disabled before reaching 18. These benefits are payable to a mother who has children in her care, and to dependent parents. A small lump-sum death benefit is also paid.

Disability Benefits

Disabled workers under 65 and their dependents may be paid monthly benefits in the same way as dependents for old-age benefits. A person is considered to be disabled if he has a mental or physical condition that is expected to last or has lasted for at least 12 months, or is expected to result in death.

Because nine out of ten American working people are now under social security, and because the system is designed to cover all gainfully employed persons, regardless of income level or type of employement, this review of social security is presented in simplified form for both the employer and employee. Social security benefits are today often the largest —perhaps only—source of income for the worker and his family after his retirement, death, or disability. At the end of February 1966, more than 21 million people were receiving over $1½ billion monthly in social security benefits. Every one is paying for these benefits from his wages withheld each payday. It therefore is important for every employer to understand the program, both for his own edification and for explanation to his employees.

Equal Rights Legislation

Proponents of civil rights and equal opportunity in employment received their most significant boost in American history when the Congress enacted the Civil Rights Act of 1964. Under Title VII of this act, the Equal Employment Opportunity Commission was established to assure that all Americans will be considered for hiring, firing, and promotion on the basis of their ability and qualifications, without regard to race, color, religion, sex, or national origin.

Major Groups Covered Under Title VII

Under Title VII, the Commission is concerned with four major groups: employers, public and private employment agencies, labor unions, and joint labor-management apprenticeship or training programs. Beginning July 2, 1965, Title VII applied to employers of 100 or more persons, labor unions with 10 or more members or which operate hiring halls, and employment agencies dealing with employers of 100 or more persons.

However, on July 2, 1966, Title VII applies to those with 75 or more employees or members. On July 2, 1967, it will apply to those with 50 or more, and on July 2, 1968, it becomes applicable to those with 25 or more employees or members.

Among those **not** covered by the provisions of the Civil Rights Act are local, state, and federal agencies, government-owned corporations, Indian tribes, religious organizations in which the employee is engaged in religious activities, and educational institutions in which the employee performs work connected with the primary activities of the institution.

What the Law Means to Employers

The basic obligations imposed upon employers are delineated in Section 703(a) of the Civil Rights Law. Provisions of this section make it unlawful for an employer to do any of the following:

1. Fail or refuse to hire or discharge any individual or otherwise discriminate against any individual with respect to his compensation, terms, conditions, or privileges of employment because of his race, color, religion, sex, or national origin.

2. Limit, segregate, or classify employees in any way that would deprive any individual of employment opportunities or otherwise adversely affect his status as an employee because of his race, color, religion, sex or national origin.

There are exceptions to the above unlawful employment practices.

1. Religion, sex, or national origin is a bona fide occupational qualification reasonably necessary to the normal operation of the business or enterprise.

2. An educational institution owned or supported by a religion employs members of that religion.

3. The persons discriminated

against are members of the Communist Party or a Communist-front organization.

4. The employer is subject to a government security program and the person(s) involved does not have a security clearance.

5. A business operating on or near an Indian reservation accords preferential treatment to Indians.

6. The different standards of compensation or terms and conditions of employment are applied pursuant to a bona fide seniority system, merit system, or other system that measures earnings by quantity or quality of production, or that results from the fact that employees work in different locations.

7. The employer acts upon the results of a professionally developed ability test that is not designed or intended to be used to discriminate.

8. Differentiation in pay based on sex are authorized under the terms of the Equal Pay Act of 1963.

Employers may not discriminate against any individual because of race, color, religion, sex, or national origin in admission to or employment in any apprenticeship, training, or retraining programs. Further, the employer cannot discriminate against any employee because that employee has opposed an unlawful practice under the Act, or because he has testified, assisted, or participated in an investigation, proceeding, or hearing.

Finally, in any advertising by employers, labor unions, or employment agencies, it is unlawful to print or publish any employment notice or advertisement that indicates any preference, limitation, specification, or discrimination based on race, color, religion, sex, or national origin. Again, however, there is an exception where religion, sex, or national origin is a bona fide job qualification for employment.

What The Law Means

The purpose of Title VII is to protect employees against any discrimination involving the employment relationship based upon race, color, religion, sex, or national origin. The protection extends far beyond mere hiring. Subject to exceptions that have been stated, employees are protected against the following:

1. Refusal by an employer to hire or a refusal by an employment agency or labor union to refer for employment.

2. Discrimination with respect to compensation, terms, conditions, or privileges of employment.

3. Limitation, segregation, or classification by an employer in such a way as to deprive employees of employment opportunities or otherwise adversely affect their status as employees.

4. Discrimination by employers, labor unions, or joint labor-management committees in admission to or employment in apprenticeship, training, or retraining programs.

5. Discriminatory classifications or referrals by employment agencies.

6. Exclusion or expulsion from membership, or other discriminatory treatment, by a labor union.

Enforcement Of Rights

The equal rights law, in Title VII, established an Equal Employment Opportunity Commission, composed of five members, It is the function of this commission to investigate and act on any charge of unlawful employment practices.

If a person makes such a charge and resides in a state that does not have a fair employment statute, the aggrieved individual files an unlawful-employment-practice charge with the Commission. The charge must be made in writing under oath. A member of the Commission who has reasonable cause to believe that a violation has occurred may also file a charge in writing. In either event, the charge must be made within 90 days after the alleged unfair practice occurred.

The Commission will first provide the employer, employment agency, or labor union with a copy of the charge, which cannot be made public. It will then investigate the charge. If the charge is found to be true, the Commission will attempt to eliminate the unlawful practice through informal conferences, conciliation, and persuasion. If after 30 days no voluntary compliance by the accused is obtained by the Commission, it may extend the time limit to 60 days if it appears that a satisfactory agreement can be reached. If there is still no agreement, the aggrieved individual may file a civil action against the accused employer, agency, or labor union in the appropriate federal district court. The case will be decided and the court will direct such affirmative action as it sees fit. If the allegation is true, the court may require the accused to rehire the aggrieved person, or reinstate him, with or without back pay. If the accused fails to comply with the court order, he will stand in contempt, and may then be subject to criminal action.

Where an individual state has a fair employment practices law, the aggrieved person must first file his charge through the state commission or appropriate agency. The Federal Commission has authority to enter into a cooperative agreement with the state or local agency, under which agreement the Federal Commission will relinquish all or part of its enforcement function to the state agency. The Federal Commission cannot act, nor can the aggrieved file a charge with the Federal Commission, until after 60 days after the beginning of proceedings on the charge by state or local agencies.

All but three of the states have fair employment practices laws, although six states have laws which provide only for criminal remedy of unlawful employment practices. The Equal Employment Opportunity Commission will not defer to these six states, but will assume immediate jurisdiction when a complaint is filed.

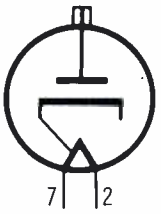
Conclusion

This article obviously is a radical departure from the usual technical articles found in PF REPORTER. However, with the recent, highly significant changes in legislation governing income tax, social security, and civil rights—and with additional legislation certain to come—it seems appropriate that information media of all categories supply to employer and employee alike not only technological data, but whatever other information that may assist in the sustained efficient operation of an independent business, enterprise, corporation, or industry. ▲

TUBE and TRANSISTOR DATA

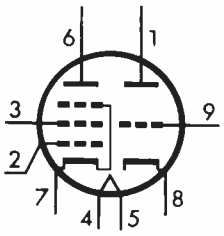
RECEIVING TUBES

3A3A
High-Voltage Rectifier
Fil.—3.15V @ .22A
PIV—30KV @ 2.0 ma



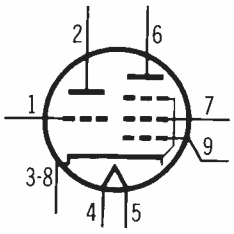
8EZ

4KE8
VHF Converter
Fil—4.5V @ 0.6A (11 sec)



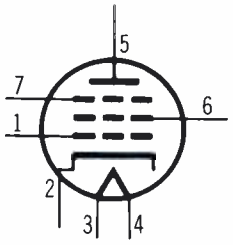
9DC

4LJ8
VHF Converter
Fil.—4.3V @ 0.6A (11 sec)



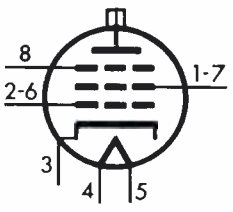
9GF

5HZ6
FM Detector
Fil.—4.75V @ 0.6A (11 sec)



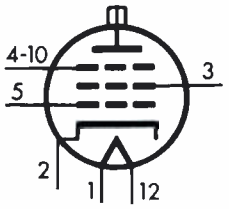
7EN

6JU6
Horizontal Output
Fil.—6.3V @ 1.6A



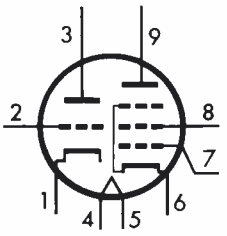
9QL
NOVAR

6JZ6
Horizontal Output
Fil.—6.3V @ 1.5A



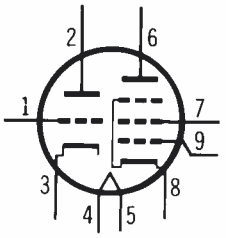
12GD

6LQ8
Pentode—Video Amplifier
Triode—General Purpose
Fil.—6.3V @ 0.775A



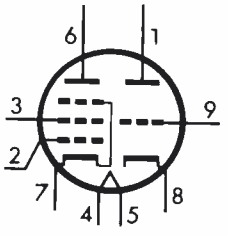
9DX

6MB8
Pentode—Burst Amplifier
Triode—Video Amplifier
Fil.—6.3V @ 0.4A



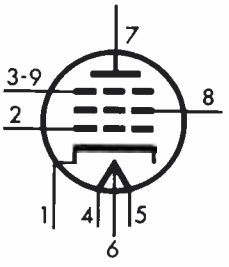
9FA

6MG8
General Purpose
Fil.—6.3V @ 0.45A



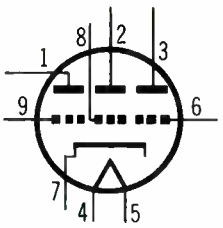
9DC

11HM7
Video Amplifier
Fil.—5.5/11V @ 0.6/0.3A



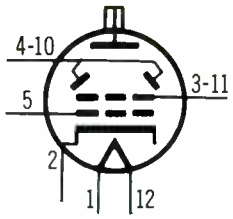
9BF

12MD8
Chroma Matrix Amplifier
Fil.—12.6V @ 0.45A (11 sec)



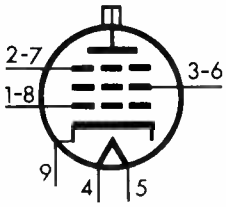
9RQ
NOVAR

23JS6A
Horizontal Ouput
Fil.—23.6V @ 0.6A (11 sec)



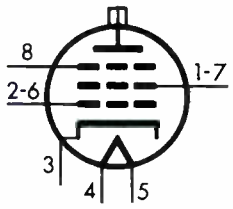
12FY

21KQ6
Horizontal Output
Fil.—21.5V @ 0.45A



9RJ
NOVAR

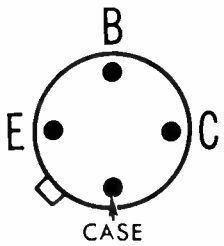
24JE6A
Horizontal Output
Fil. 24.0V @ 0.6A (11 sec)



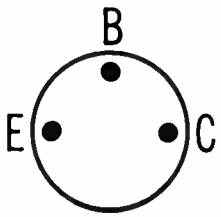
9QL
NOVAR

TRANSISTORS

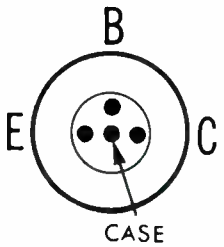
AF124
FM IF Amplifier
PNP—Germanium



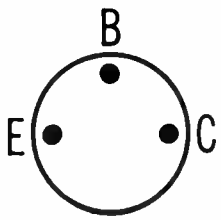
2SB43
Sync Separator
NPN—Germanium



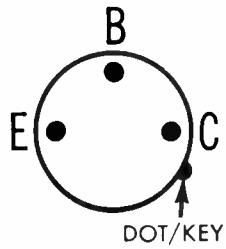
2SA74
AGC Keying
PNP—Germanium



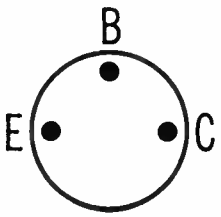
2SB175A
Audio Amplifier
PNP—Germanium



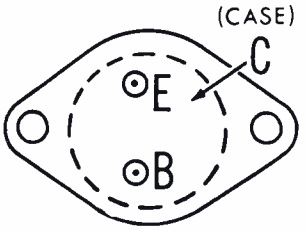
2SA103
Audio IF Amplifier
PNP—Germanium



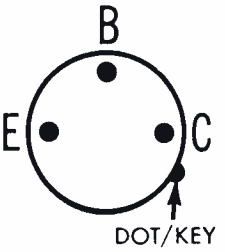
2SB202
Vertical Oscillator
PNP—Germanium



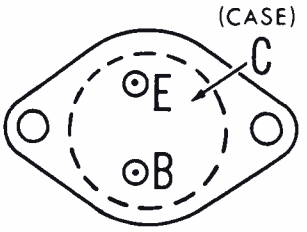
2SB232
Horizontal Amplifier
PNP—Germanium



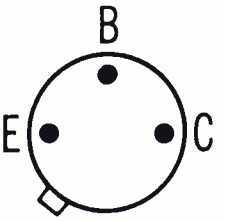
2SC58A
Video Amplifier
NPN—Silicon



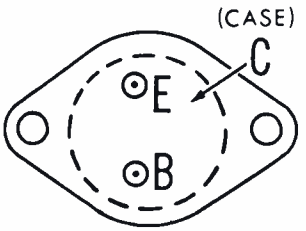
2SB275
Horizontal Output
PNP—Germanium



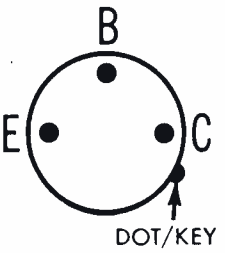
2SC154
Video Amplifier
NPN—Silicon



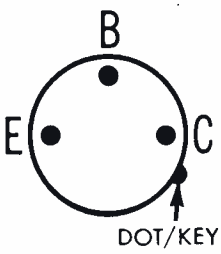
2SB368V
Horizontal Driver
PNP—Germanium



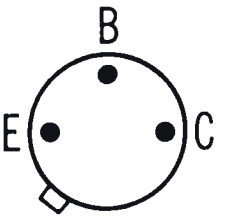
2SC179
Sync Amplifier
PNP—Germanium



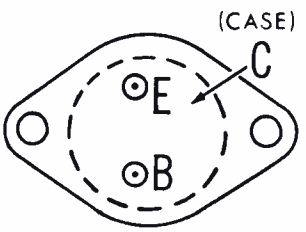
2SB408
Horizontal Oscillator
PNP—Germanium



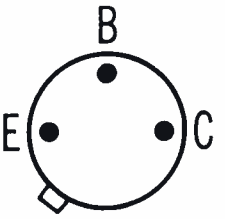
2SC206
Video IF Amplifier
NPN—Silicon



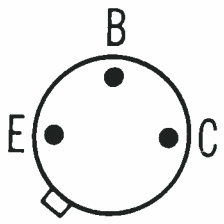
2SB425
Vertical Output
PNP—Germanium



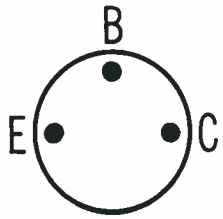
2SC208
Video IF Amplifier
NPN—Silicon



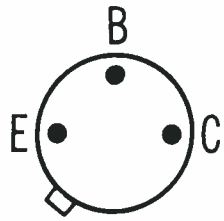
2SC291
Horizontal Driver
NPN—Germanium



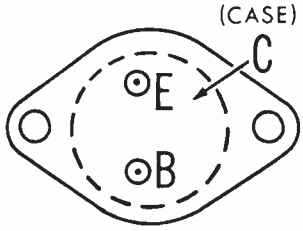
2SC313
UHF Oscillator
NPN—Silicon



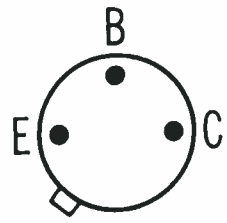
2SC293
Vertical Output
NPN—Silicon



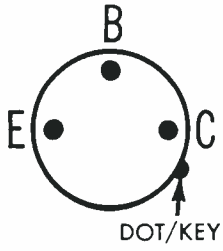
2SC518
Horizontal Output
PNP—Germanium



2SC299
Vertical Output
NPN—Silicon



2SD30
AGC Amplifier
NPN—Germanium



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How to Sell and Install TV Antennas

by Lon Cantor

You can make good money in multiple TV antenna systems. The demand for these systems is at an all time high, primarily because of one factor: color TV. Last year pointed up the tremendous growth of color TV. During 1965, for the first time, more money was spent on color receivers than on black-and-white sets.

Most people who buy color sets need new antennas to get good reception. Further, most people who buy color sets already own one or more black-and-white TV sets. Thus, they need a home antenna system capable of serving several TV sets.

The TV technician interested in entering the multiple TV antenna system field will also find lucrative markets in small motels, apartments, and schools. (With the spread of educational TV, many schools throughout the country are being equipped with TV antenna systems.) But the most obvious prospects at the present are TV dealers. Many dealers are still limping along with inadequate antenna systems. They should be made aware of the fact that a professional antenna system can be an indispensable sales tool. It makes an exceptionally good system to supply excellent color signals to a number of color sets simultaneously. Yet, unless the dealer demonstrates excellent pictures, his sales may be seriously hampered.

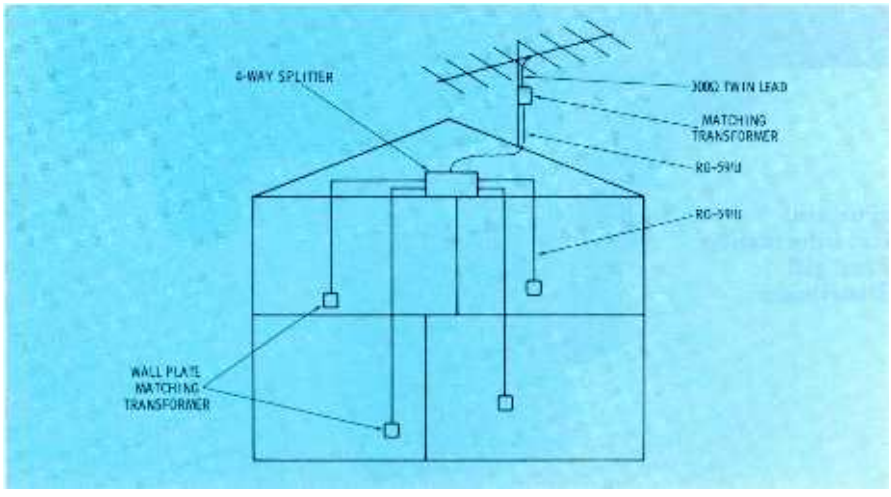

Fig. 1 Typical home TV antenna system using 4-way splitter.

Inertia is probably the main reason so many dealers put up with inadequate showroom systems. No one has ever offered to sell them a professional system. However, in the areas where technicians have made a concerted sales effort, results have been gratifying.

Here are some pointers on selling multiple system to TV dealers:

1. Make up a basic system package and price that you can sell—with minor variations—to all dealers in your area.

2. Show the dealer the inadequacies of his present system in terms of picture quality. Point out color smears, ghosts, interference, etc.

3. Explain the advantages of a professional TV system. Tell the dealer how important it is for him to demonstrate the best possible quality in color pictures.

4. Offer to tie in antenna sales with the dealer's set sales. That is, give him a price for installing a good antenna system in the customer's home. In this way, the dealer can promise the customer that the picture he gets in his home will be as good as those he sees in the store. Both the dealer and the TV technician can profit from these sales.

5. Offer him a professional system capable of handling his entire sales floor at a specific price.

Fig. 2. Mast-mounted preamplifier.

6. Once you have sold a showroom system, use it as a case history to sell others. If possible, get a testimonial from the dealer stating that his color sales have increased by X% since installing your system.

It is a little more difficult to sell multiple systems to motels, apartment houses, and schools, but often these prospects will buy, once it becomes known that you are capable of handling them. As for home systems, you should attempt to sell them on every service call.

Fig. 1 shows a simple home TV antenna system, handling up to four TV sets. Notice that coaxial cable is used, although shielded twinlead could also be used.

Every multiple system, of course, starts with the antenna. No system can be better than its antenna. While the antenna signal can be amplified its quality can never be improved. Antennas for multiple systems are similar to those used with single-set systems, except for the following considerations:

1. The bigger the system, the better the antenna you can use. If antenna cost is to be amortized over a large number of TV sets, your customers can afford to spend a little extra for it. There are special, ruggedized antennas made specifically for multiple TV systems, but it is not essential to use these.

2. You can't use a rotor on a multiple TV system. All TV sets connected to the system must be capable of receiving all channels; and unless all channels are received from the same general direction, you must use more than one an-antenna. Antennas can be combined with hybrid splitters or couplers.

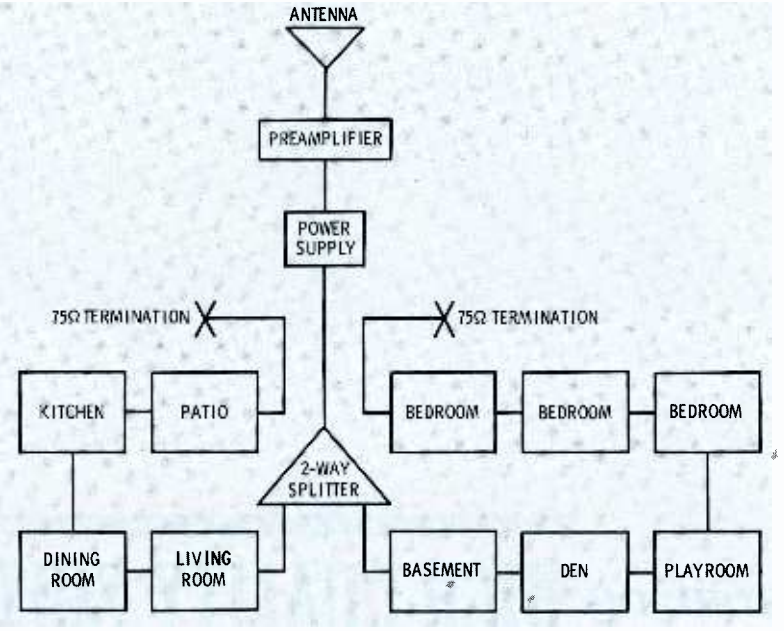

Fig. 3. Elaborate home system with tapoffs in each room.

3. Special pains should be taken to make the output of the antenna clean and ghost-free. Special filters and traps are available to eliminate many kinds of interference. Antennas can be stacked and phased to eliminate ghosts. (See "Phasing Multiple-Antenna Systems," July '65 PF REPORTER).

A small multiple system in a good signal area does not require a preamplifier. A four-way splitter, plus a matching transformer for each TV set, will usually provide satisfactory performance. Each TV set in the system shown in Fig. 1 will get approximately half as much signal voltage (—6 db) as would a single set, connected directly to the antenna. In many areas, this 6-db loss would be tolerable. However, where signals are not strong, a preamplifier will be required. The preamplifier (shown in Fig. 2) fits into the system between the antenna and the four-way splitter.

Fig. 3 shows a more elaborate home TV system. Notice that it provides an antenna outlet in every room of the home, plus the basement and patio. Of course, it's not likely that any of your customers will have ten TV sets in their home. But many people do have portable sets, as well as FM radios. The home system can be sold on the basis of flexibility. Point out to your customer that it is pleasant to move a TV set into a child's bedroom when he is sick, or to watch TV on the patio during summer evenings, or to bring the stereo FM receiver into the basement for a party.

The antenna signal is amplified by a broadband, high-gain preamplifier. The output of the amplifier is then split into feeder lines. Although the system shown in Fig. 3 uses a two-way splitter, you can also use a four-way splitter if four feeder lines make the job easier to install. This will be determined by the layout of the house. Each room is then equipped with a tapoff. The tapoff is connected in parallel to the feeder line with a small portion of the feeder line signal going through the tapoff to each TV set.

There are two basic kinds of tapoffs: 75-ohm output and 300-ohm output. All tapoffs have an input impedance of 75 ohms, but their output may be either 75 ohms, to match coaxial cable, or 300 ohms, to match twinlead. The advantage of a 300-ohm output is that no matching transformer is needed to match the output of the TV set. However, twinlead can pick up direct signals, while coax is shielded. In deep suburban or fringe areas, you can generally get away with 300-ohm output tapoffs. In strong signal areas, you will have to use 75-ohm outputs and a separate, set-mounted, matching transformer to eliminate ghosts.

The system shown in Fig. 3 can be adapted to small motels and apartment houses. In either case, an

• *Please turn to page 75*

servicing HIGH-QUALITY SOLID-STATE equipment

by Allan F. Kinckiner

In the consumer-electronic products servicing and maintenance industry, it is widely recognized that 1965 was the year in which color TV sales attained a respectable position. Not so widely recognized or realized is the fact that 1965 was the year in which solid-state devices received general acceptance by prime manufacturers in their quality lines. It is true that these same manufacturers were content and willing to produce small portable transistor radios, but when it came to high-fidelity audio or FM equipment vacuum tubes were still preferred. In fact, as late as 1963 some design engineers for several top-quality firms authored technical papers espousing the superiority of tubes in high-quality equipment. Apparently, many of these same firms now seem to be the most enthusiastic users of transistors in Hi-Fi audio, FM and multiplex equipment.

The almost zero background noise level, the absence of residual hum, and the clean tone qualities characteristic of well designed solid-state amplifiers are all apparent to the buying public. The compactness, the cooler operation, the greater expectancy of trouble-free long-life operation, and other strictly technical features are not so apparent. They do, however, make strong selling points when properly advertised. All of these factors added together helped to produce, in 1965, tremendous sales of solid-state AM-FM tuners, stereo and multiplex FM, high-power Hi-Fi amplifiers, and high-quality record players.

Because solid-state equipment is more nearly trouble-free than similar equipment using vacuum tubes, it might be supposed that the switch to solid state has reduced business for service and repair shops. This has not been the case—shops specializing in Hi-Fi, stereo, and FM tuner servicing are busier than ever. There are numerous reasons why this is true: (1) Transistors **DO** become noisy, leaky, weak, or shorted just as tubes do, although with a lower failure incidence. (2) Modifying this failure incidence ratio somewhat is the fact that several transistors are frequently used to perform the same function that one tube can perform; i.e., the use of three transistors for RF, oscillator, and converter in FM front ends, whereas one twin triode can perform the same duty in tube-equipped units. (3) A transistor failure invariably results in a shop job, while a tube failure often results in a "do it yourself" repair by the customer, (4) Capacitors, resistors, coils, etc., in solid-state equipment have about the same rate of failure as similar components in tube equipment. (5) Because of the lower noise, residual hum levels, and cleaner tone found in new solid-state equipment, the customer is more critical of slight deficiencies and therefore more desirous of obtaining repairs. (6) The inclusion of AFC, stereo indicators,

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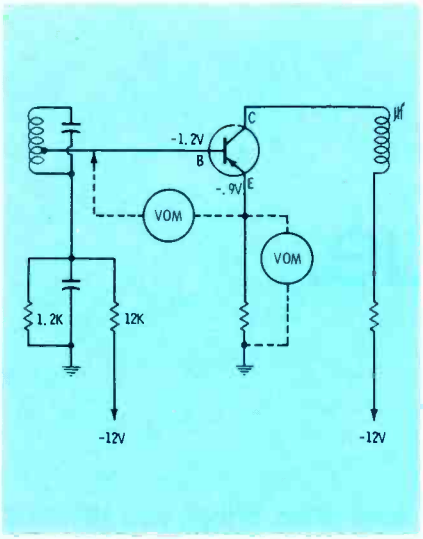

Fig. 1. Voltages on typical transistor.

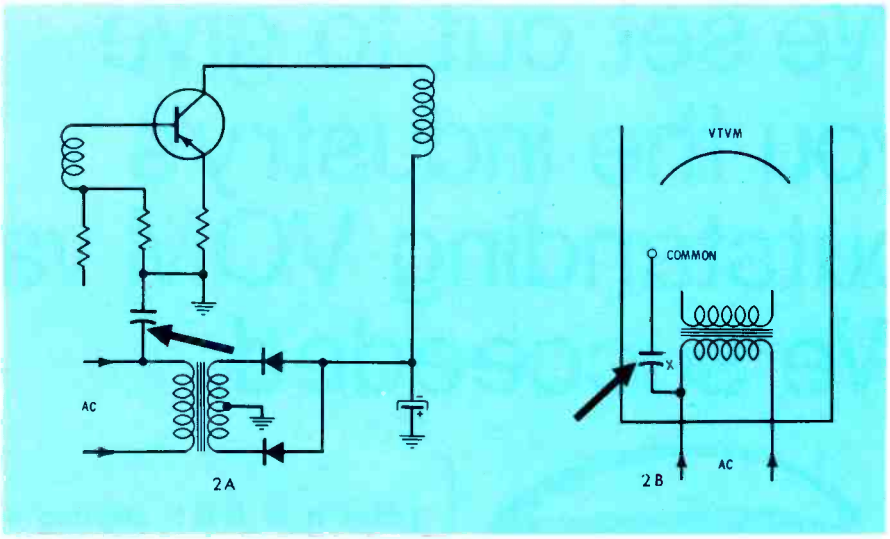

Fig. 2. Components producing a potential between common or ground of equipment and common lead of VTVM.

and tuning meters in high-quality tuners creates a fair share of service work, because many customers rely heavily on these auxiliary features and will demand service when they are below par.

Servicing

Until quite recently, texts concerning the servicing of transistor equipment used the "compare transistors to tubes" approach, in which the collector, base, and emitter are compared to the plate, grid, and cathode, respectively. Later texts, however, deny the validity of the "transitor vs. tube" approach; they favor the "transitor is a different breed" approach, in which transistors are not to be compared to tubes. Also, the voltage, current, and resistance parameters of transistors should be learned and understood without comparison to vacuum tubes.

Neither approach is altogether right or wrong, depending on the troubleshooting procedures of the individual technician. The technician who limits troubleshooting of vacuum-tube equipment to voltage and resistance checking will probably use the same technique with transistors; however, he must learn the voltage and resistance parameters that are peculiar to transistors. The technician accustomed to troubleshooting tube equipment using signal injection and scoped signal traces can use the "compare transistors to tubes" approach, because signal-handling characteristics of tubes and transistors are comparable. A combination of the two approaches is actually the most effective and efficient procedure; a scope or injected signal should be employed to locate the defective stage, after which voltage readings are taken at transistor elements in that stage.

In reading voltages on transistors in line-powered equipment (the type discussed in this article), a VOM offers more flexibility and safety than a VTVM. Fox example, with a VOM, voltages can be read directly between elements, or voltage on the elements can be read with respect to ground (see Fig. 1). In using a VTVM, the transistor element voltages should be read only with respect to ground. Fig. 2 explains why. The transistor circuit in Fig. 2A is powered by a rectified DC obtained from a secondary of a power transformer. Note that the primary of the power transformer has a buffer capacitor from the AC line to DC common or ground. The VTVM (Fig. 2B) is also powered by DC obtained from a rectifier in the secondary winding of a power transformer. Note again that the primary of the power transformer also has a buffer capacitor between the AC line and DC common. Actually, there will be a potential between the common or ground of the solid-state equipment and the common of the VTVM. Therefore, if the VTVM's common is applied to the base of a transistor, this potential is capable of destroying the transistor. The potential depends on the VTVM and the equipment being tested. In some combinations the potential is only a very mild electrostatic charge; in other cases it can be a measurable AC voltage. Employing a line-isolation transformer to power the solid-state equipment, or placing one between the line and the VTVM, will virtually eliminate danger arising from this condition.

Another feature favoring the VOM is the accuracy of reading transistor bias. Refer again to Fig. 1; to obtain a bias voltage reading, the voltage from emitter to ground is read first. Next, voltage from base to ground is read; the difference be-

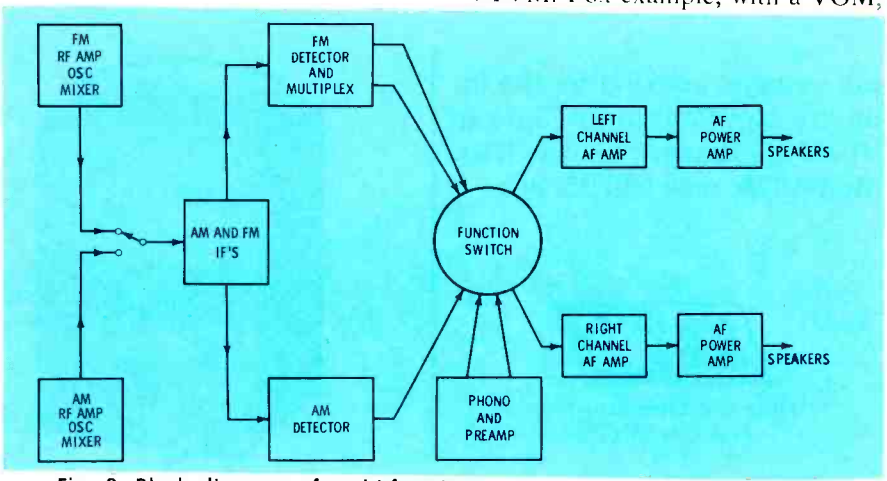

Fig. 3. Block diagram of multi-function equipment aids troubleshooting.

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tween the voltages is the bias. Since these voltages must be read on a one and one-half volt range (at least), reading to tenths of a volt is not easy, but this should be done when reading transistor bias with a VTVM. Reading this same bias directly from base to emitter is done more accurately using a VOM, and if the VOM has a one-volt or one-half volt scale, accuracy is enhanced considerably. The extremely high input impedance of a VTVM has some advantages, but a VOM with a sensitivity of 20,000 ohms per volt (or better), is sufficient for solid-state voltage readings.

Logical Suspicions

Multifunction equipment, such as the solid-state receivers and amplifiers under discussion, can be considered in sections and drawn in simplified block diagrams like Fig. 3. Considering it in this way leads to the "logical-suspicion" approach in troubleshooting. Thus, if one audio channel is weak, dead, or distorted on both phono and stereo FM, suspicion would logically fall on the audio amp or audio-output. If, however, the condition existed only on phono or stereo FM, first the phono cartridge, then the phono preamp stage, or the FM detector/multiplex stage would logically be suspected. An AM complaint would cast suspicion on the AM-FM, oscillator, mixer, and the AM detector stages. FM trouble would be suspected as arising in the FM-RF, oscillator, mixer, or the FM detector/multiplex-stages. Complaints concerning both AM and FM would cast logical suspicion on the FM & AM-IF stages. In some receivers all IF stages are not used for both AM and FM amplification, which will, of course, slightly modify suspicion. The nature of some complaints scatters suspicions while other types of complaints will pinpoint suspicions more closely. In many cases, the more closely pinpointed suspicions will require only voltage readings. The scattered-suspicions type of complaint, or one concerning the IF block where both AM and FM are not treated similarly, will call for signal-injection or scope-tracing procedures before taking voltage readings.

Specific cases

Case No. 1: General Electric Chassis TU376-1.

Complaint: No AM.

Since this symptom suggested two logical suspicions the scope was used with the options of scoping at the anode of the AM detector diode (see Fig. 4), or the tank circuit of the AM oscillator. Because the oscillator tank circuit was more quickly identified, the low-capacity scope probe was applied to CircuiTrace point 47. Absolutely no signal was found at this point, conclusively indicating a dead oscillator stage. Correct voltages at both collector and base of Q5, the

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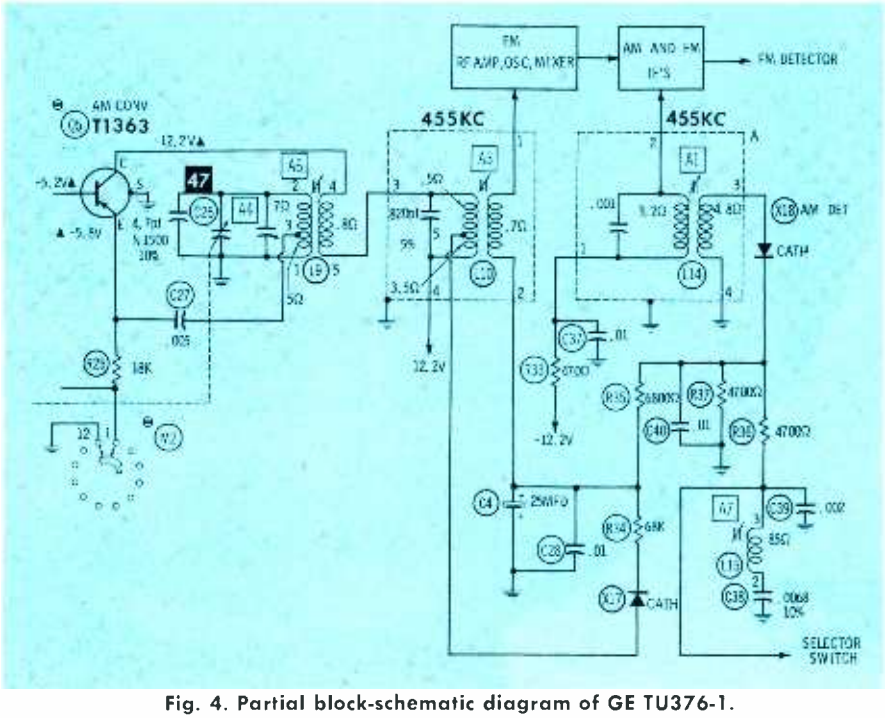

Fig. 4. Partial block-schematic diagram of GE TU376-1.

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& sales come faster
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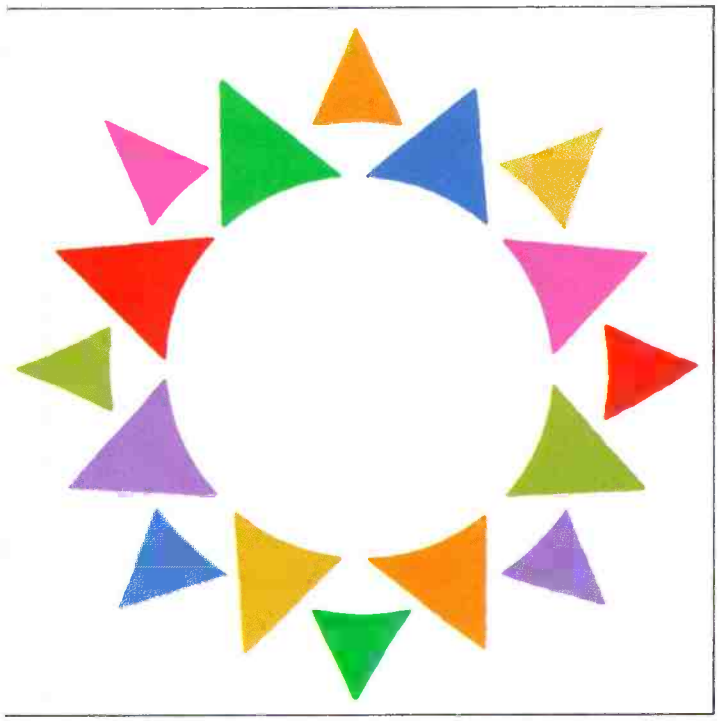

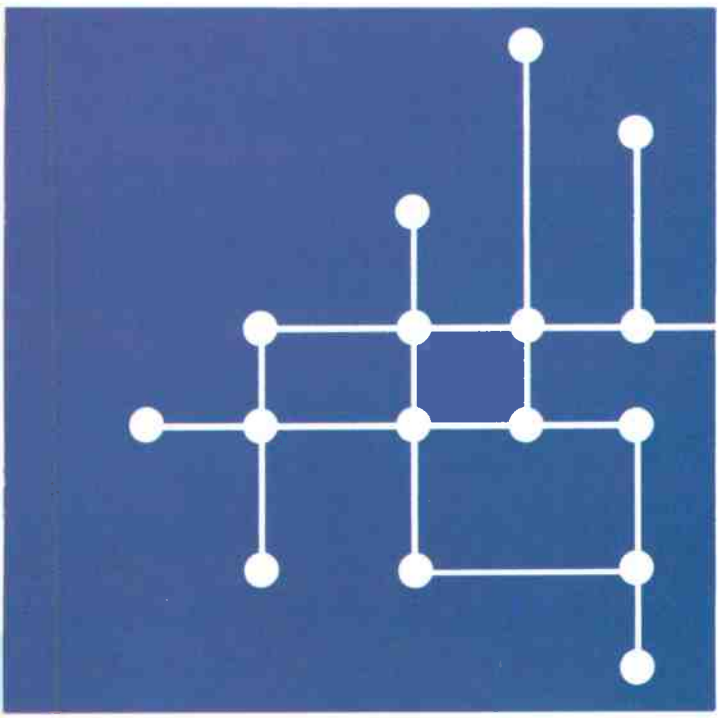

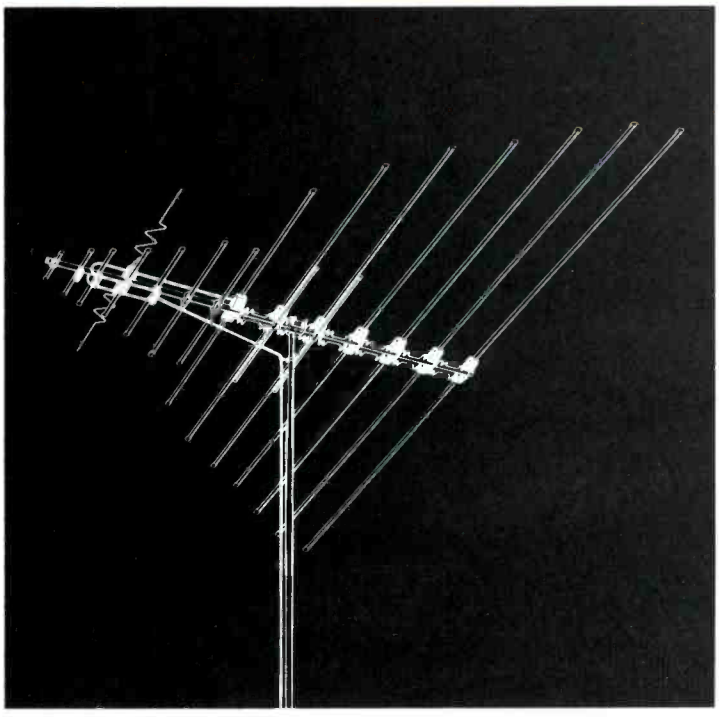

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Seems like we've been telling people (millions of them) about engineered-for-color Winegard antennas long before there were color tv sets. Not true, of course. But it's been a long time. Longer than any other antenna manufacturer. Since 1955, to be exact.

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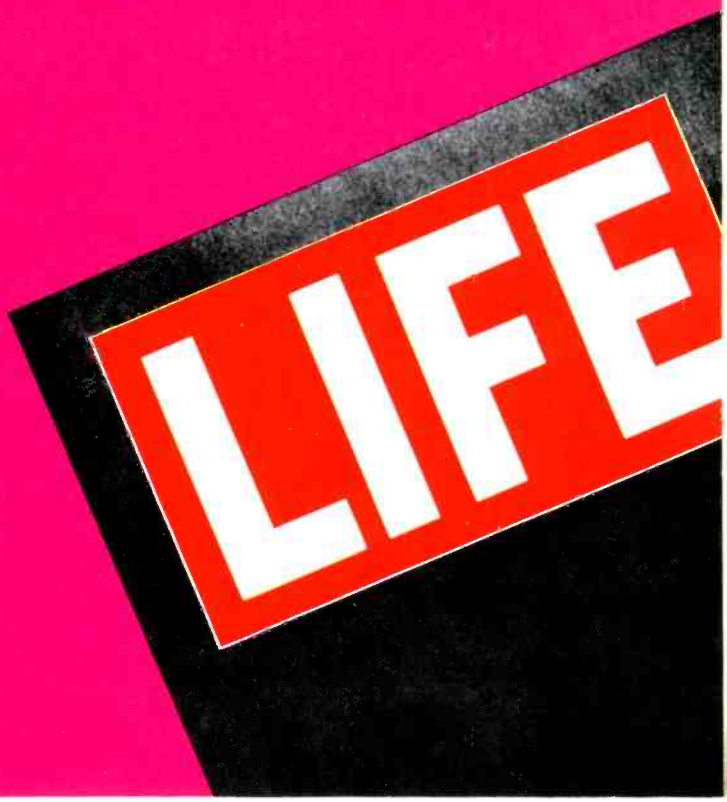


Life Magazine

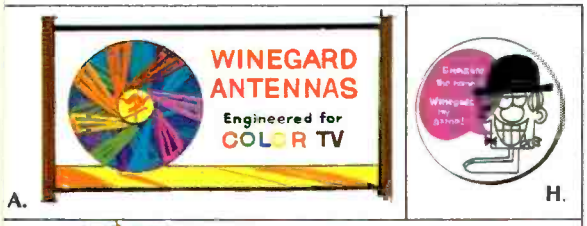
The more than 32,000,000 (that's right, 32 million) readers of Life magazine will start seeing Winegard ads in September. And they'll keep seeing them every month right through next March. They are prospects for color tv sets—and your prospects for engineered-for-color Winegard antennas. Will they remember Winegard when they buy color tv? We guarantee it!

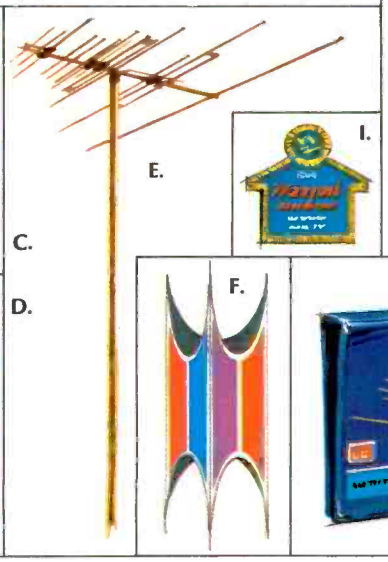
HERE'S WHY SALES COME FASTER

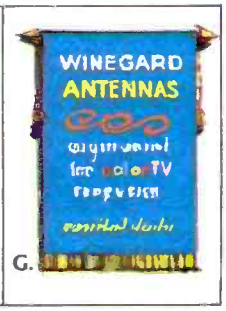
TV Commercials Coast-To-Coast

Winegard has scheduled thousands of color tv commercials to be seen from coast to coast starting in September. They will be seen in major markets by millions of people shopping for color tv sets. And they'll have all those people pre-sold on engineered-for-color Winegard antennas, no matter which set they buy.

AND EASIER WITH WINEGARD!







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F. *Antenna Pole Display Sign*
G. *Silk Wall Banner*
H. *Salesman's Coat Badge*
I. *Shirt Emblem*
J. *Dealers' Sales Presentation Book*
K. *Dealer Vehicle Identification Program*

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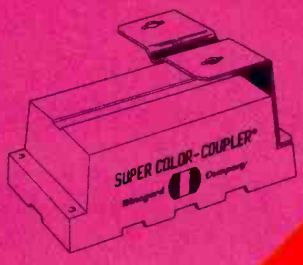

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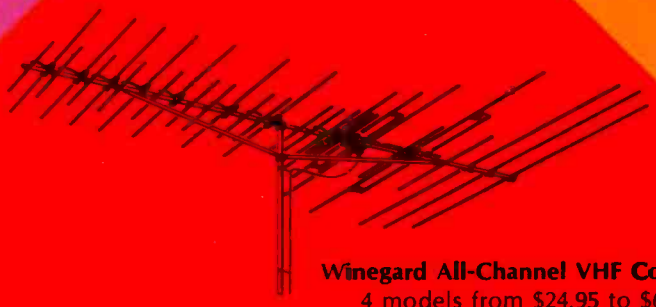

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Solid State

(Continued from page 40)

AM oscillator, and zero voltage at the emitter pointed to an open transistor. Installation of a new unit restored AM operation, and the scope indicated a normal 8-volt sign across L9 and C26. Incidentally, the GE distributor advised that transistor #EA16X28 is suggested as a replacement rather than the original #EA15X29.

Case No. 2: RCA Chassis RC-1218A.

Complaint: No FM.

The tuning meter deflected on AM but not on FM, casting suspicion on the FM-RF amplifier, oscillator, and mixer stages; but before digging in, the schematic was carefully studied. It was noticed that the first transistor in the FM & AM-IF was used only for FM-IF amplification (see Fig. 5). A 10.7-MHz signal injected at the base of Q6 fed through to the speakers, but the same signal applied to the base of Q3 produced nothing. Zero volts at the emitter of Q3 and correct voltage at the other elements led to the replacement of Q3. As expected, the set returned to normal operation.

Case No. 3: Philco Chassis N25ST.

Complaint: No FM.

Several odd symptoms accompanied the complaint in this receiver: 1. The "no-FM" condition prevailed only when the monaural/stereo FM switch (M5 in Fig. 6) was in the stereo position. In the mono-FM position, both stereo and mono-FM signals fed through as normal mono-FM. 2. With M5 in the stereo position, the stereo-indicator lamp remained illuminated, even when the AM/FM selector switch was in the AM position. All these conditions cast logical suspicion on the multiplex section.

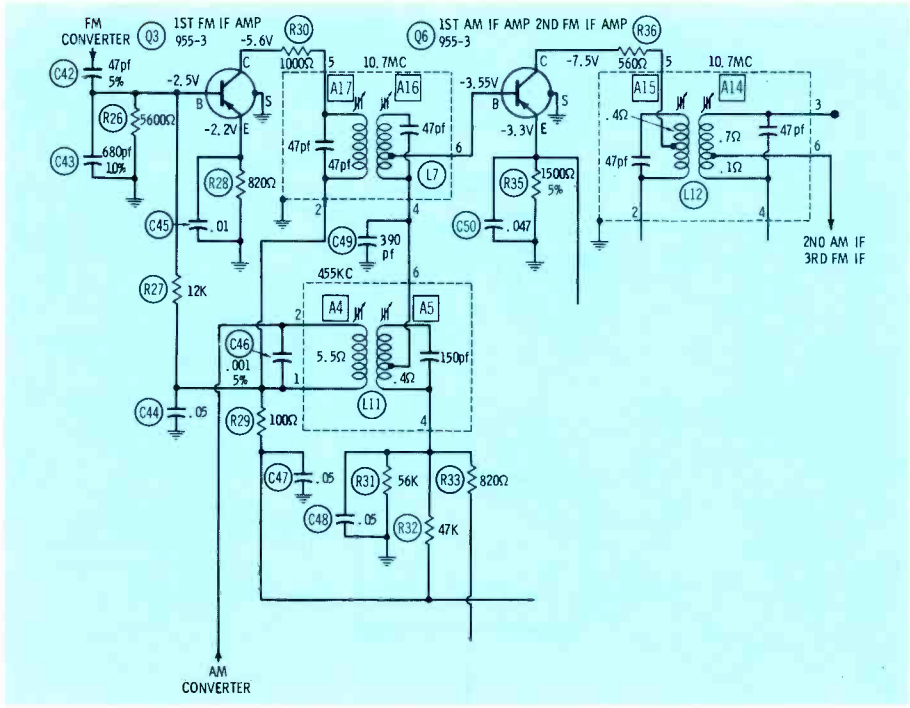


Fig. 5. Schematic of FM and AM-IF block of RCA RC-1218A.

The multiplex circuit operates during both monaural FM and stereo-FM reception. Monaural FM is received, detected, fed through C53 to the base of Q7, through Q7 to the emitter, through diode X29, and through C56 to the center tap of the secondary of L25. This audio signal is entirely unaffected by the windings of the secondary of L25 and passes through from the center tap to the terminals of the winding,

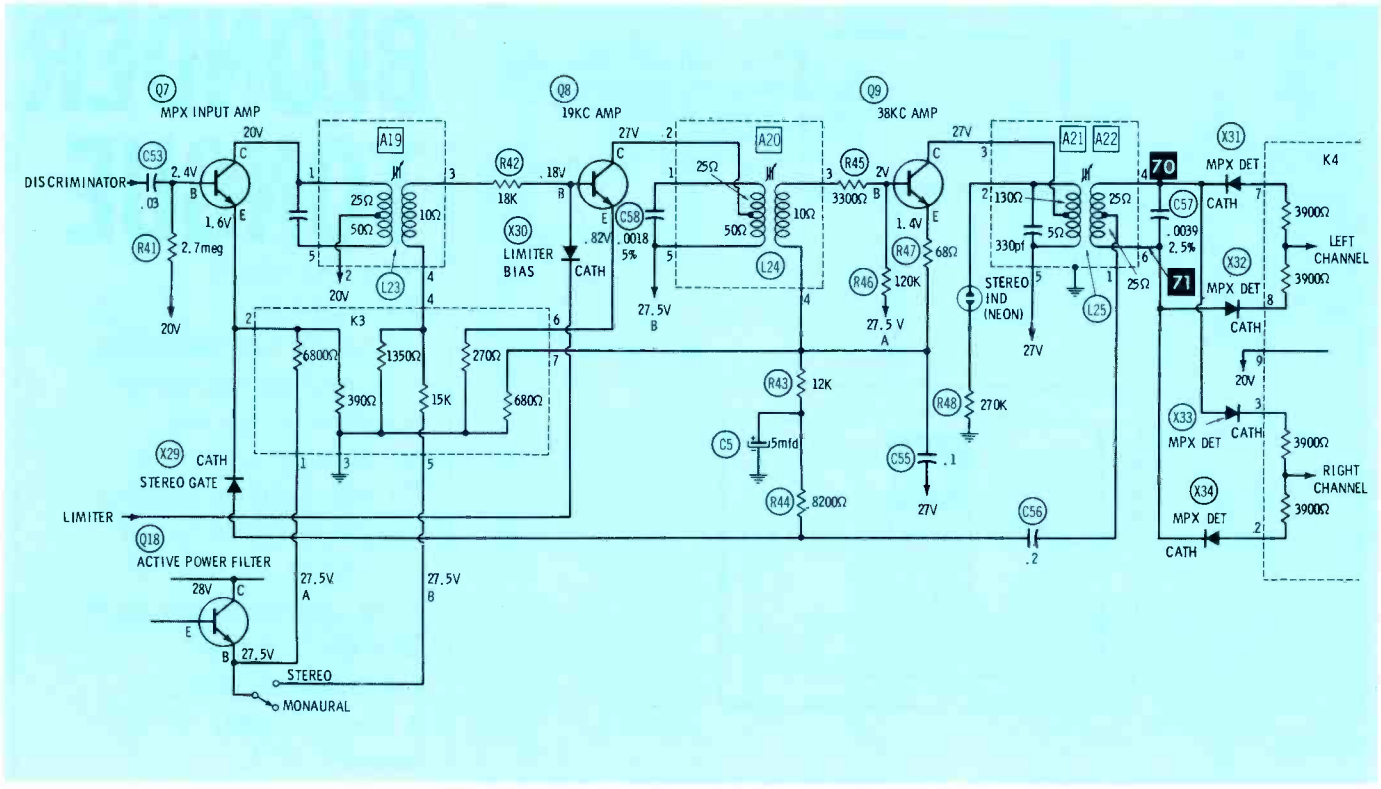
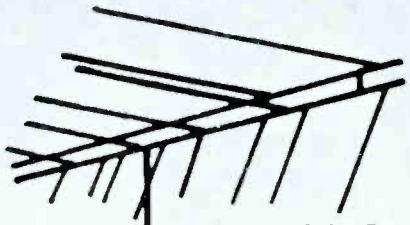


Fig. 6. Multiplex section of Philco Chassis N25ST.



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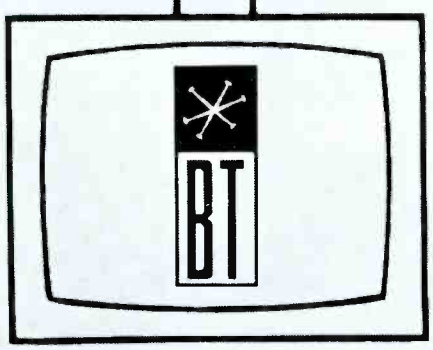

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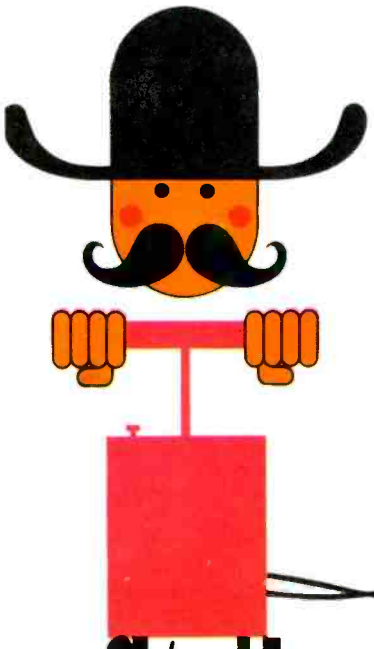
points 70 and 71. Since signals at points 70 and 71 are equal and in phase, they present equal signals to the MPX detector diodes.

Diode pairs, X31-X32 and X33-X34, conduct at all times and feed the inputs of the right and left channels of the audio amplifiers with the same monoaural signal that was present at the FM discriminator.

When a stereo FM signal is received, its audio content is detected by the discriminator and also passes through Q7, X29, and C56 to the center tap of the secondary of L25. But the two L and R signals that comprise stereo FM are accompanied by a 19-kHz pilot signal that is likewise detected by the discriminator and fed to the base of Q7. This pilot signal is amplified slightly by Q7 and is coupled through L23, a 19-kHz tuned transformer, to Q8 where it is amplified considerably. The output from the collector of Q8 is coupled through L24, another 19-kHz transformer, to Q9. The primary of L25 is tuned to 38kHz, so that the secondary produces two outputs of opposite polarities, 180 degrees out of phase. With the L and R signals at the center of the secondary also being 180 degrees out of phase, either of the secondary terminals will present only one of the L or R signals. The MPX detectors will pass only the L or R signals that are synchronous with the phase of the 38-kHz signals and will gate off the L or R signal that is out of phase, providing the right and left channels of the audio amplifier with separate L and R audio signals corresponding to the audio modulation broadcast by the station. When M5 is in the monaural position, Q8, the 19-kHz amplifier does not operate, and there is no 38kHz to gate off either of the synchronous-detector pairs, X31-X32 and X33-X34. Therefore, stereo FM feeds through just like monaural FM.

The primary winding of L25 has a step-up ratio so that when a 39-kHz signal is present, enough signal will be generated to light the neon stereo indicator. Note that a 38-kHz signal is produced only when a 19-kHz signal is fed to the base of Q7 and only if the stereo/monaural switch is in the stereo position. Knowledge of the circuit's operation and consideration of this last fact resulted in scoping at the hot lead of the neon indicator. A large noise signal of over 100 volts was found any time M5 was in the stereo position. The signal looked like transistor noise, so Q7 was removed—but no change. Next, Q8 was removed and the noise signal vanished. Replacing Q8 restored the set to normal operation. It wasn't suspected that a noisy Q8 could produce enough signal to light the neon stereo indicator. One more point might be explained: Why the "no-FM" condition? Apparently the noise was capable of gating off the synchronous detectors.

The servicing techniques and troubleshooting methods discussed up to this point will prove both effective and time-saving. As pointed out, the proper choice and application of test equipment, together with a logical method of troubleshooting, add up to quicker servicing of solid-state Hi-Fi audio, FM, and multiplex equipment. Additional troubleshooting aids and a discussion of audio-amplifier troubles will be the subjects of Part 2. Be sure to save this issue so that you can refer to the methods and techniques introduced in this portion of the article. ▲



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Girls of all ages will have fun combing and recombing its tresses. 12" high and 12" long. Pale yellow body with white ears and tail.

TAKRAW GAME—2 PLAYER SET (TB-11056)
Originated in Malaya. Comes with two cane cages for throwing and catching, plus large plastic ball. Great for kids and adults, the motions are similar to those in the game of Jai Alai.

"MARCIE AND HER TROUSSEAU" FASHION DOLL (TB-800)
Marcie is a doll of real elegance . . . complete with a wardrobe of fashionable clothes. Fashion-conscious little ladies will have fun dressing Marcie for different occasions.

WEBSTER NEW AMERICAN DICTIONARY (TB-1016)
Newly revised and up-to-date, this is an authoritative dictionary planned and written by modern educators to meet high standards for school, home, and office use.

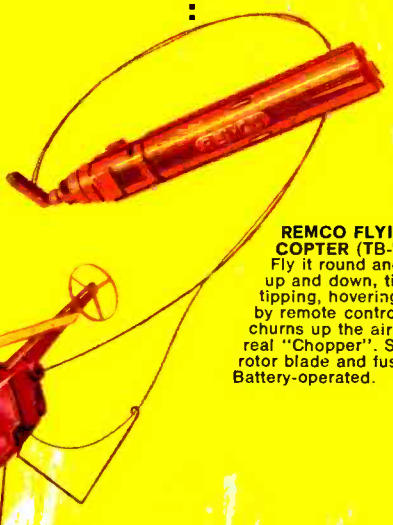
AMF 20" ROADMASTER AMFLITE GIRL'S DEBUTANTE BICYCLE (TB-U5287)
Girls will go for its styling . . . twin strut *high-rise* handle bars, chrome headlight and fenders, contour-styled buddy saddle, white sidewall tires . . . in flamboyant magenta with white trim.

TWO-SIDED 18" DART BOARD (TB-03016)
Made in England. This board is ¾" thick for long steady service. Comes with six English-made darts; has 20 point target with Bull's eye on reverse side.

LOUIS MARX "ZAZOOM" DUMP TRUCK (TB-5204)
This automatic dump truck features *real motor noise*. Three separate switches activate 21 different functions. Boys will spend hours with this thrilling true-to-life toy.

A gold mine of gifts can be yours when you buy RCA entertainment receiving tubes! RCA's TOY BONANZA brings you a comprehensive selection of toys for boys and girls . . . and an authoritative, up-to-date dictionary and an encyclopedia for the entire family. Great for birthdays, Christmas . . . *any time* you want to make the kids happy!

AMF 20" ROADMASTER BOY'S RENEGADE DELUXE BICYCLE (TB-U1278)
Every boy can be king of the road! 20" cantilever frame, chrome-plated truss rods, *high-rise* chrome handle bars and chrome fenders, white sidewalls . . . in a handsome blue with white trim.



REMCO FLYING STUNT COPTER (TB-751)
Fly it round and round, up and down, tilting, tipping, hovering . . . all by remote control. It churns up the air like a real "Chopper". Sturdy rotor blade and fuselage. Battery-operated.

REMCO "BATMAN" ELECTROMAGNETIC WRIST RADIO (TB-795)
"Batman" is never without his wrist radio. Loud, clear, 2-way voice transmission with secret code buzzer. Comes with 2 wrist radios and wires. Sends and receives voice and code.

AMF JUNIOR MUSTANG (TB-A535)
A child-pleaser if ever there was one, this pedal-drive junior car has *real Mustang Sports Car styling!* 36" long by 16" wide, in bright red finish with black, white and silver trim.

Notes on Test Equipment

analysis of test instruments . . . operation . . . applications

by T. T. Jones

CRT Tester

Fig. 1 shows the latest CRT tester developed by **Amphenol.** In addition to all of the usual tests performed by such instruments, the model 855 has some unique functions and features. The most radical of these features is the inclusion of a voltmeter. With this, you can measure the voltages presented to the CRT by the receiver under test. There are two ranges on this voltmeter — 1000V and 50 KV, full scale. The latter range utilizes an accessory probe which is not included, but easily obtainable. The probe recommended by the manufacturer is RCA type WG-297 with a WG-210 multiplier. Without this accessory, the 50-KV range reads 5 KV full scale, and can be used for measuring voltages present at G2 of color sets. This voltage may be as high as 1200V in some models. We have found in the past that many cases of dim picture can be traced to this boost voltage, rather than the CRT itself, so a quick measurement seems in order. The meter is protected by a pair of diodes so that it is virtually impossible to burn it out.

Another nice feature is the socket cable. All test sockets are on one cable, with a handle attached. There will be no fumbling or untangling to find the proper socket.

The rejuvenation is accomplished in the usual manner, applying a positive voltage to the control grid. However, this unit uses a somewhat lower voltage than usual, about 250 volts. The steps of rejuvenation intensity are produced solely by increasing heater voltage (see Fig. 2). The 510-ohm resistor in the circuit acts as a fuse, to prevent damage to the tester if the tube develops a short while being rejuvenated.

We tried rejuvenating a 19XP4 which showed absolutely no cathode emission, and it came up into the green on the first shot in the "rejuvenate low" position.

The CRT Commander is housed in a very attractive leatherette-covered wood case, and presents a very professional appearance.

For further information circle 73 on literature card

Fig. 1. CRT tester has KV meter.

Amphenol #855 Specifications

Functions:

(A) Tests:
- Continuity and shorts
- Cutoff and emission
- Relative balance (color tubes)
- Life test
- Gas

(B) Repairs:
- Burn out shorts
- Weld open cathodes
- Rejuvenate B&W
- Rejuvenate color (each gun separately)

(C) Measurements:
- 0-1KV (20K ohms/volt)
- 0-50KV (with optional probe)

Power required: 117 VAC 60 Hz

Size (HWD): 12½" × 10" × 5½"

Weight: 7½ pounds

Price: $89.95

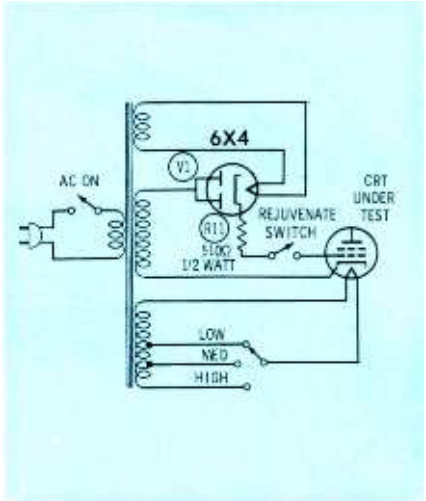


Fig. 2. Schematic of rejuvenator.

Battery-Operated Color Generator

Expanding their broad line of test instruments, **SENCORE** has introduced a new solid-state color generator. Dubbed the "Lo-Boy," the Model CG-10 features all-new circuits. All controls and adjustments can be reached without removing the cabinet. This feature enables the operator to obtain a stable pattern at extremes of temperature range and battery condition. The countdown circuits are adjusted on the front panel. The procedure is not difficult. As proof of that statement, we loaned the unit to a friend to converge his set at home. However, we forgot to give him the instruction manual. He finished the job in twenty minutes!

Only three counter stages are used in the CG-10. Essentially blocking oscillators, they differ only in component values. The horizontal oscillator (TR3) is the first counter. It operates at 15,750 Hz, triggered by

SENCORE CG-10 Specifications

Color Pattern:
Standard "Keyed Rainbow" —10 bars.
0-200% level

RF carrier:
Factory-set on channel 4, tunable from channels 2 through 6.

Dots:
117, adjustable size.

Vertical bars:
9, adjustable width.

Horizontal bars:
13 when receiver is adjusted properly.
14 may be visible if raster is compressed.

Crosshatch:
9 × 13 bars

Color Gun killers:
Passive shorting network, 100K on each grid.

Semiconductor complement:
10-2N2923, 2-2N404, 1-40234, 1-2N1180, 6-1N34A, 1-8-volt zener.

Power requirements:
8 size "C" cells. Drain is 20ma on color, 16ma on all other functions.

Size (HWD):
3" × 10¼" × 8½"

Weight:
5½ lbs.

Price:
$89.95

Poll shows appliance dealers prefer Channel Master color antennas by tremendous margin. We're not surprised. Read why.

When it comes to color antennas, we know our place. That it happens to be **first** place—and that Channel Master has been up there a long time—is a sweet thing to know. (Just try and budge us.)

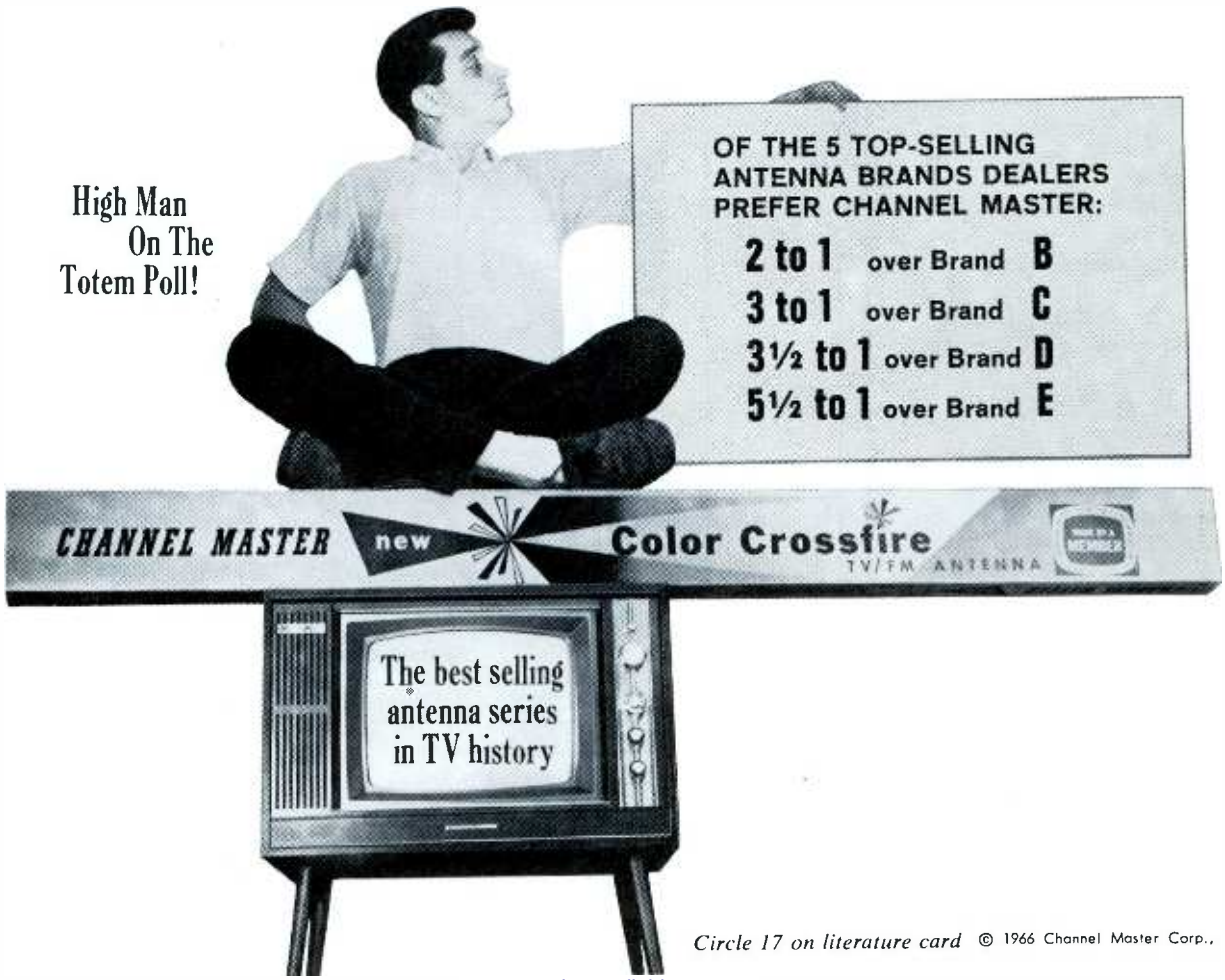
But—once in a while—isn't it nice to have somebody else confirm what you've always known?

What happened was this: One of the nation's top three publications in the radio-TV-appliance merchandising field—(name on request)—made an independent survey of color set appliance dealers. Result? The lopsided box-score, in case you haven't noticed, is down below. Please observe that the opposition isn't even close.

Now as long as Channel Master Crossfires are up there we wanted to know why they're up there. So we requested the same publication to take a second poll. And just as we thought: Any specific brand of antenna may be preferred on many counts. But one reason leads all the rest. Performance! That's why the Crossfires are No. 1. They work better! (With color sets or black-and-white, naturally). This includes our VHF/FM series for suburbs-to-fringes, our Coloray ghost-killer series, and our Ultradyne Crossfire 82-channel FM or Ultradyne UHF only series.

To what do we owe our success? Our principles. (Unique engineering ones, of course. All of them patented or with patents pending.) They make the Crossfires the mightiest antennas ever developed. With remarkably high gain and up to 30-to-1 front-to-back ratios. (Maybe the competition's principles just aren't as powerful as ours.)

So call your nearest Channel Master distributor, join the rest of the gang, and come on up. The installation's fine and the profit's high.



Circle 17 on literature card

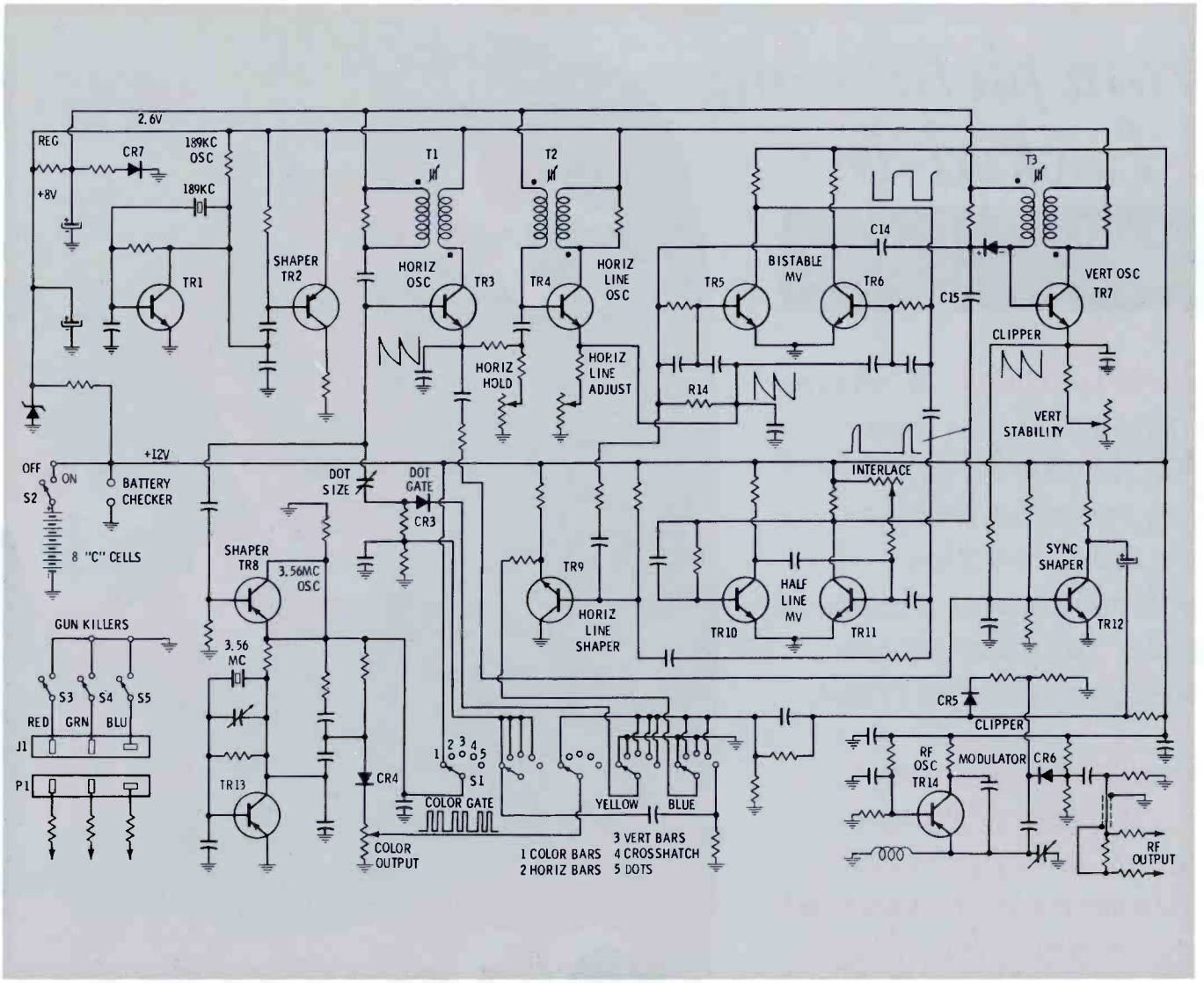


Fig. 4. Essential schematic shows how signal is developed.

the 189-kHz signal developed in TR1 and shaped by TR2. Part of the output of the horizontal oscillator is fed to the sync shaper (TR12) and then modulates the RF oscillator. The remainder of the 15,750-Hz signal is fed to TR4. The output from TR4 triggers the multivibrators TR5&6 and TR10&11. These operate at 450 Hz, but half a cycle apart. The result is a 900-Hz signal fed through C14 and C15 to the third counter, TR7. This stage divides by 15 and furnishes the 60-Hz vertical signal. The firing point of the multivibrator TR10&11 can be controlled through a range of about 20 microseconds by the interlace control, and thus shifts the horizontal lines of one field with respect to the other. This insures a sharp, single dot at the center of the raster.

The rest of the generator is rather straightforward. The rainbow signal is developed in the usual way, with a gated 3.56-MHz oscillator modulating the RF. The RF oscillator's frequency is controlled by C39, and many be set at any frequency from 55 to 84 MHz (channel 2-6).

The unit is housed in the Econoline case, a vinyl-covered sheet steel, with a brush-finish chrome panel. An AC model, the CG-138 has just been released. This unit is exactly the same except that it uses line voltage instead of batteries, and has a 4.5-MHz sound oscillator included, for fine tuning adjustments.

For further information circle 72 on literature card

Fig. 3. Lo-Boy color generator.

ERRATUM

In the June article "Leave Those Parts in the Circuit." Table 3 was inadvertently omitted. It appears below.

Table 3

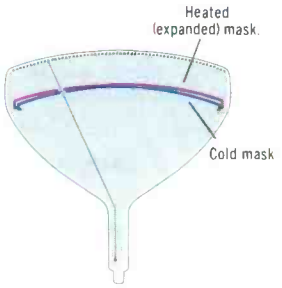
Power Transformers and Chokes	60-100 Hz
Audio and Modulator Transformers	1000 Hz
Horizontal Output Transformers	15 kHz
AM IF Transformers	500 kHz
FM IF Transformers	10 MHz
RF Coils	aligned freq.

From picture-on ... Locked-in

Color Purity

Perma-Chrome a unique feature available only in RCA color TV picture tubes, provides temperature compensation which eliminates the beam register problem due to shadow mask expansion.

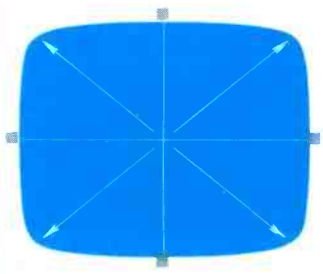
No more set-up time lag... No more "guesstimated" yoke positions... within minutes you can set an optimum color picture on a rectangular Hi-Lite tube and be sure of customer satisfaction whether his set operates for half an hour or half a day!



Brand "X" tube without *Perma-Chrome* Exaggerated drawing of cross-section of rectangular Brand "X" tube shows the expansion of the shadow mask and the change in beam-landing register.

RCA Hi-Lite tube with *Perma-Chrome* Exaggerated drawing shows locked-in register of beam with phosphor dot as shadow mask is heated. NOTE: Mask moves toward face of tube as it expands. Apertures in shadow mask move along paths of electron beam as mask expands or contracts with rise and fall of tube temperature.

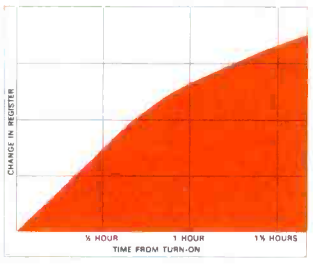
Non-uniform temperature expansion of the shadow mask is caused by the design limitations of 3-position non-symmetrical mounting in Brand "X" rectangular picture tubes. Shadow mask expansion thereby develops from a point other than the geometric center of the mask.



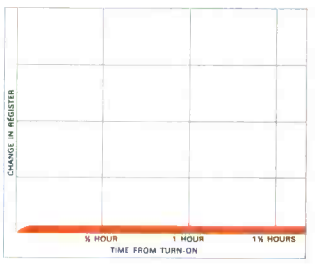
RCA's 4-position mounting makes possible the successful achievement of a temperature-compensated shadow mask assembly. RCA Hi-Lite rectangular tubes with PERMA-CHROME, as well as RCA 21-inch round color tubes, lock the apertures of the mask "on target" with their respective phosphor dot trios.

Perma-Chrome

lets you quickly, positively, and accurately adjust Hi-Lite rectangular color TV picture tubes to the full potential of their rare-earth phosphor screen…from picture-on throughout normal operation at temperature equilibrium. Easier for you… much more satisfactory for your customer. Tube set-up errors due to shadow mask expansion are a thing of the past…and your customer gets the full benefits from the set's "auto-degauss" feature. You owe it to yourself to check with your authorized RCA Distributor about the full advantages of this exclusive innovation from the acknowledged leader in color television. Call him today and ask about Perma-Chrome …currently in the 25-inch and soon to be available in the 19-inch!



Change in register of electron beam and phosphor dot versus time for rectangular Brand "X" tube using three-position shadow-mask mounting.



Change in register of electron beam and phosphor dot versus time for RCA Hi-Lite rectangular color picture tube with PERMA-CHROME.

RCA Electronic Components & Devices,
Harrison, N.J.

RCA®

The Most Trusted Name in Electronics

Business Interruption

loss of income

by Ralph H. Butz

Ed Jackson,insurance adjuster, spent several hours with Frank Harwick tabulating fire damage to the building and contents of the Harwick Company. After Jackson left, Harwick walked over to see Jim Carter, whose property adjoined the Harwick building.

"The heat and smoke from my building must have caused considerable damage in your place," Harwick said.

"Not too much, Frank; possibly a few thousand dollars. I called the insurance company. They are sending a man here to check the loss with me. Glad it isn't more. I'd be in bad shape if it had been my building and stock instead of yours. I wouldn't be able to do business for at least four months."

"I took care of that contingency a few years ago," Harwick replied. "I had gone along for years with fire and contents insurance on the property, thinking I was fully insured. One day my banker pointed out how I could be hurt with nothing but property insurance in the event it would take a long time to repair fire or storm damage. He advised me to buy business interruption insurance, and I followed his advice. Now I'm going to collect $4,000 each month under that contract, up to five months. By that time I should have everything fixed up to resume business."

"I thought I was fully insured," Carter commented, "but I don't have that kind of insurance."

"Then you aren't fully insured if fire or storm damage would close your business for months. You'd have to use money collected for property insurance just to pay expenses coming up all the time while there was no income from the business."

"I'll have to look into that," Carter agreed. "Does that kind of insurance cost a lot of money?"

"Not as much as I had expected when the banker talked about it. In my case I'm paying about 50 percent of the property insurance rate for the business interruption policy. For damage from a fire as bad as this, I estimated I'd be short about $20,000 gross income over a five-month period. The insurance was written to pay me $4,000 a month up to five months. If I can resume business in less time, I collect only for the time I couldn't operate."

"Right now I'm insurance poor," Carter complained. "I have to do some careful thinking before I buy more."

"It might pay you to do some hard thinking," Harwick replied. "Just take a good look at my place and figure what you would do if it had been your property."

"I guess you're right, Frank. When I think of all the expenses that would continue it might be enough to put me out of business. If I used property insurance money I'd be short of funds to continue the business. I wouldn't be able to pay my assistant his salary. He'd look for another job. I'm going to ask my insurance company about its rates."

Carter was one of a large number of businessmen who think they are fully covered for loss if they carry adequate property insurance, unaware that losses sustained during a long shutdown can be of major proportions.

Credit-reporting agencies have compiled statistics indicating that when business establishments report severe loss by fire or storm, four out of ten such firms never resume business. Another four out of ten continue to operate in a restricted way, and with impaired credit. Two out of ten continue in business without restriction and without impaired credit. The sound financial position of many in the latter group results from some form of coverage to cover loss of income during interruption periods.

Business interruption insurance is the safety factor that provides normal earning income when business is suspended because of fire or some other form of physical damage Where the gross earnings form is used, the gross earnings represent the difference between cost and selling price of goods.

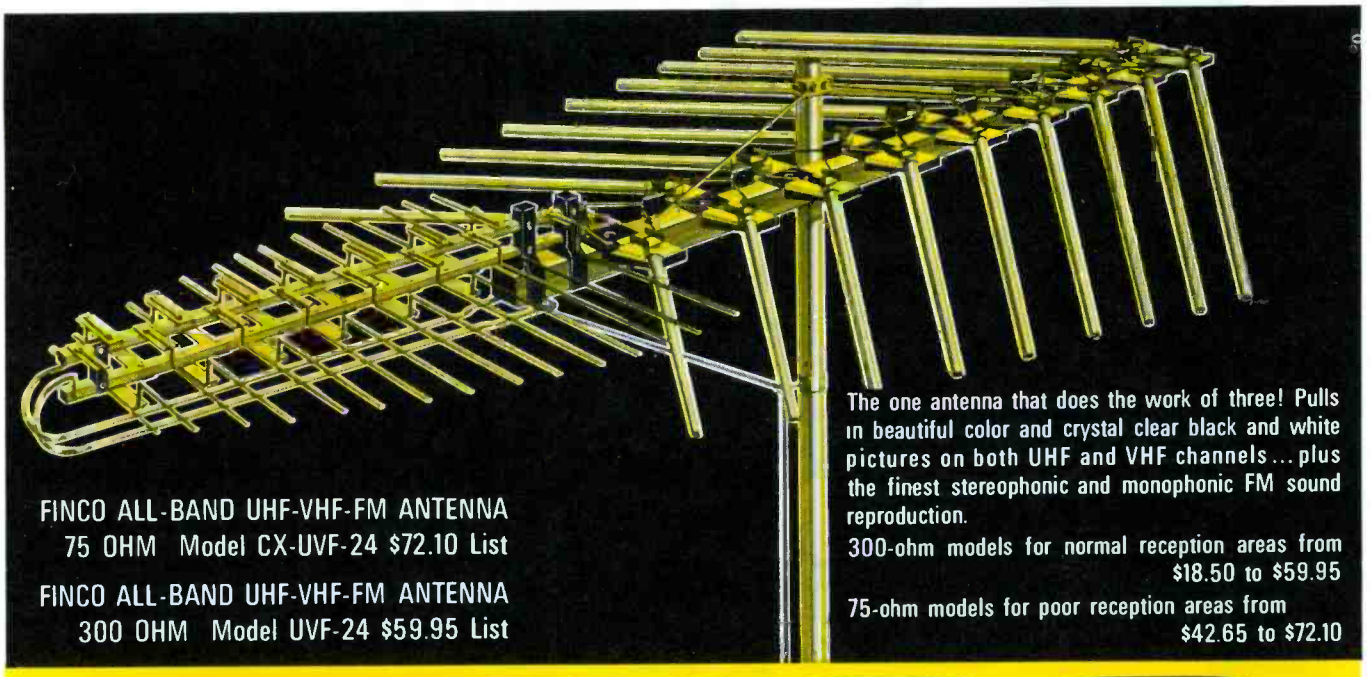
In addition to the gross earnings form, there are many other forms that can be tailored to meet specific needs of any type of business. In a manufacturing business the earnings formula may be based on selling price of the finished product, less cost of material and processing.

In certain businesses there may be cases where some time elapses between the actual beginning of operations and the time *normal* operations are resumed. In such instances special forms may be used as endorsements to extend the period of indemnity up to the start of normal operations.

Several types of consequential income loss can occur after restoration as, for instance, loss of customers, inability to obtain seasonal material, and suspension, lapse or cancellation of contracts or orders. Such contingencies may be covered by special endorsements to the policy.

A variation of business interruption coverage is known as *Extra Expense Insurance*. This additional coverage may be used in combination with the business interruption form.

Some types of business cannot afford to shut down regardless of the property damage sustained. Service businesses of various types can suffer catastrophic losses if they are unable to furnish continuous service. When operations are disrupted they may have to arrange for a temporary location to continue in business, or may have to make arrangements with another firm to furnish needed services. It is in situations of this kind that extra expense coverage is vital. ▲



The one antenna that does the work of three! Pulls in beautiful color and crystal clear black and white pictures on both UHF and VHF channels... plus the finest stereophonic and monophonic FM sound reproduction.

300-ohm models for normal reception areas from $18.50 to $59.95

75-ohm models for poor reception areas from $42.65 to $72.10

FINCO ALL-BAND UHF-VHF-FM ANTENNA
75 OHM Model CX-UVF-24 $72.10 List

FINCO ALL-BAND UHF-VHF-FM ANTENNA
300 OHM Model UVF-24 $59.95 List

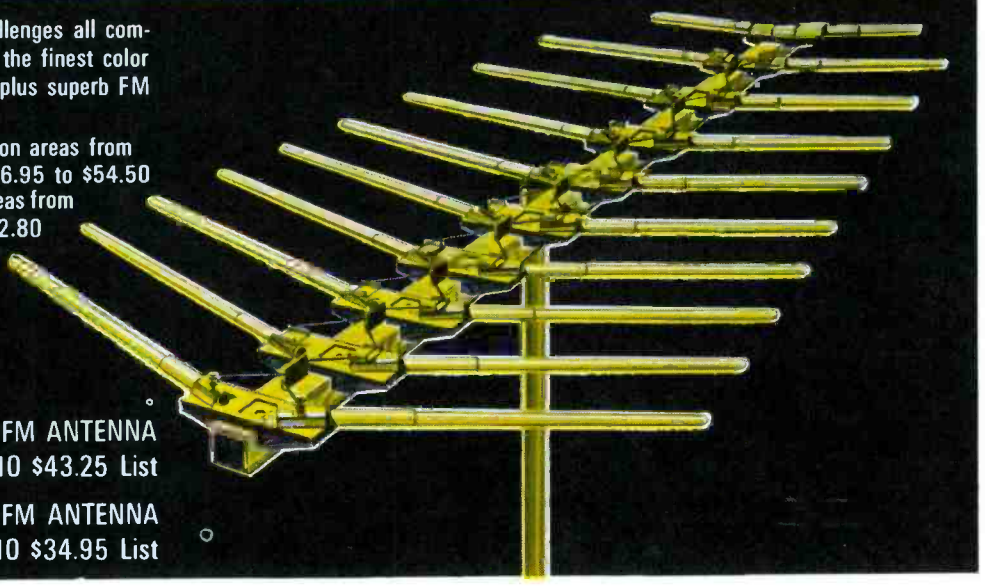
FINCO

introduces / 75-ohm COLOR VE-LOG ANTENNAS FOR UHF-VHF-FM RECEPTION

Finco's Swept-Element Antenna challenges all competition. Its unique design assures the finest color and black and white TV reception—plus superb FM and FM Stereo tone quality.

300-ohm models for normal reception areas from $16.95 to $54.50

75-ohm models for poor reception areas from $18.55 to $62.80



FINCO SWEPT-ELEMENT VHF-FM ANTENNA
75 OHM Model CXVL-10 $43.25 List

FINCO SWEPT-ELEMENT VHF-FM ANTENNA
300 OHM Model VL-10 $34.95 List

FREE! ALL FINCO CX-VL, CX-UVF AND UVF ANTENNAS COME WITH A FREE INDOOR SET-MOUNTED TRANSFORMER, VHF-UHF TRANSFORMER SPLITTER OR VHF-UHF SPLITTER.

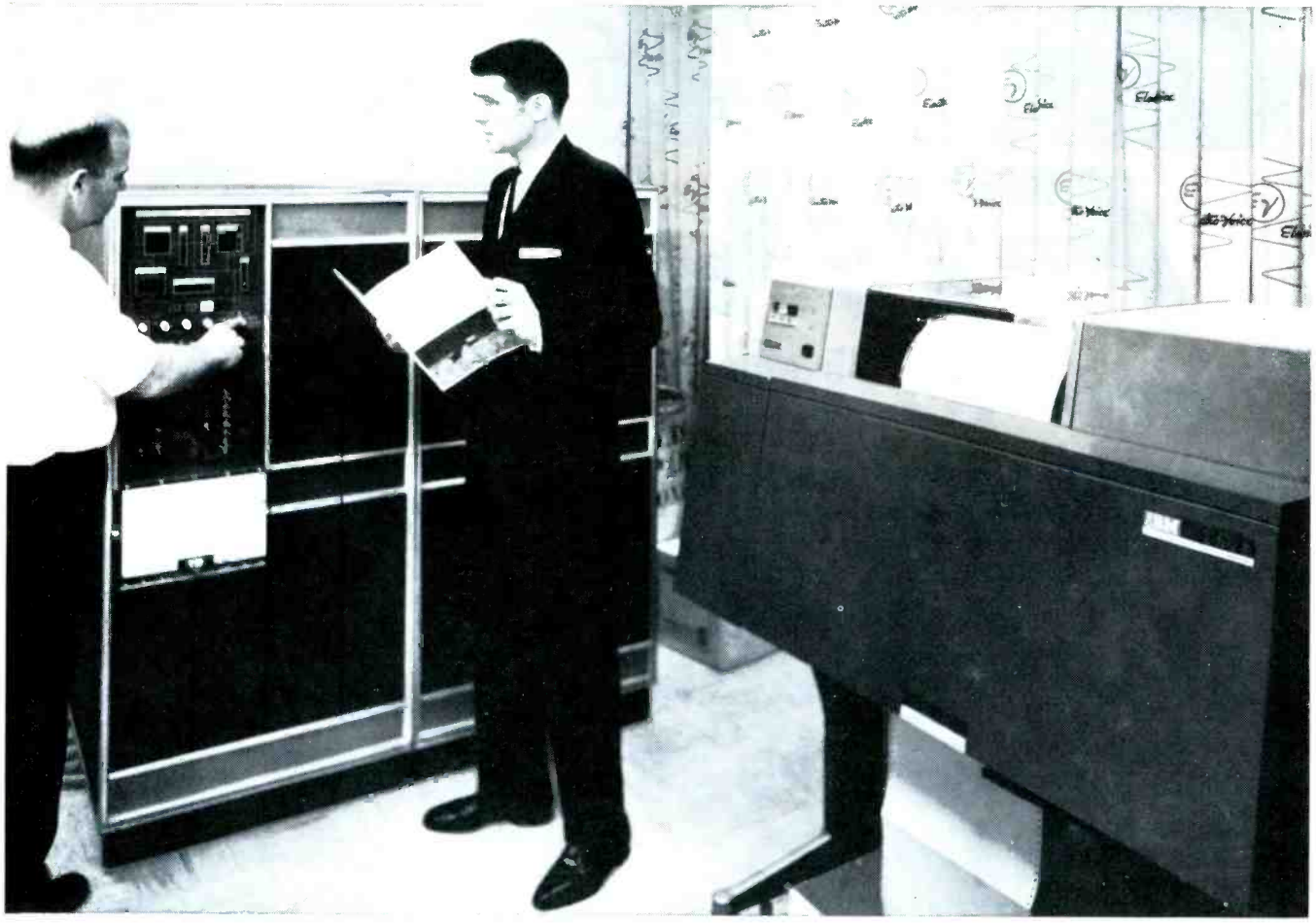
MAKER OF THE WORLD FAMOUS COLOR FINCO BLACK / WHITE HOME COMPONENTS AND ACCESSORIES

THE FINNEY COMPANY

34 WEST INTERSTATE STREET, DEPT.310, BEDFORD, OHIO

Circle 19 on literature card

This is the only computer in the phono cartridge business!



Our IBM computer keeps track of every needle and cartridge model on the market. On command it prints the most accurate, complete, up-to-date phono needle and cartridge catalogs in the business.

And in its spare time it computes the precise selling ratios of every model, then issues instructions that help your E-V distributor keep stocked with fresh, exact replacements when you need them.

Ask today for your copy of the latest E-V needle and cartridge catalogs. They're at your Electro-Voice distributor's. He's the fellow with the computer behind him!

Electro-Voice®

The *modern* complete line of replacement phono cartridges

ELECTRO-VOICE, INC., Dept. 967R, 632 Cecil Street, Buchanan, Michigan 49107

Circle 20 on literature card

Whats Wrong With This Picture?

by Thomas R. Haskett

Obviously there is insufficient horizontal sweep—or is there? Which of the following do you suppose is the cause?

1. Weak horizontal output tube.
2. Low plate or screen voltage on horizontal output.
3. Increased value of horizontal output cathode resistor.
4. Shorted drive capacitor.
5. Shorted width control.
6. Shorted linearity control.
7. Defective horizontal winding in yoke.
8. Shorted capacitor across yoke winding.
9. Shorted turn in flyback transformer.
10. Open screen-bypass capacitor in output circuit causing parasitic oscillation.
11. Weak damper tube.
12. Shorted capacitor in damper-cathode circuit.
13. The TV station is at fault.

If you selected No. 13 as the cause, you win. Despite the appearance of the picture, the receiver was not at fault. The proof is illustrated below:

Pictures like this appeared on the *same receiver* interspersed between shots like that displayed above. What is the explanation? Solution on page 62.

BOOK REVIEW

Audio Systems: Julian L. Bernstein; John Wiley & Sons, Inc., New York, 1966; 409 pages, 5½" × 8½", paperback, $4.50.

This is a volume in the "Electronics Engineering Technology" series of textbooks designed for use in advanced courses in electronics. The book contains basic theory, mathematical development of theorems, design considerations, and solutions to example problems in specific design applications.

More than half of the volume is concerned with network theory, concentrating on the areas of impedance matching, mixing and dividing networks, attenuating pads, and equalizing systems. One chapter develops the use and application of the terms "decibel," "dbm," and "volume unit," and thoroughly details the use of logarithms in audio measurements.

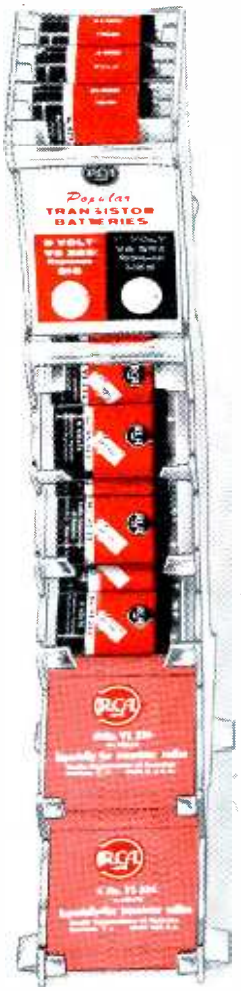
Various types and classes of amplifiers are explained and developed, while basic circuits in both vacuum-tube and transistor terms are provided. The advantages and disadvantages of interstage coupling devices and circuits are discussed, and mathematical analysis of these show their effects on system fidelity.

Other, but relatively short, chapters are given to recording systems (disc, magnetic, and film) and audio transducers (microphones and speakers). Each unit or system is discussed, and the principles and theory of their operation are explained in text, diagrams, and photographs.

This volume is intended for, and is within the capabilities of, any electronic service technician able to acquire the knowledge required for a first-class radiotelephone license. Although primarily a textbook, it contains tables and other data which permit its employment as a permanent reference work. ▲

SELL

THE TOP TWO TRANSISTOR TYPES



1P1216 Slide Rack
Capacity: 3 doz. units

...in only 3¼ inches of counter space

1P1193 3-Prong Rack
Capacity: 3 doz. units

...in only 4½ inches of counter space

Measure for measure... inch for inch... we challenge you to compare the sales you'll rack up from RCA Transistor Batteries with any other product requiring so little space. Remember, young America consumes transistor batteries and almost 50% of today's market is 25 years of age or under. So squeeze extra sales out of a few square inches with a profitable product geared to today's market. Especially one carrying such an unquestioned brand name. Want more information? Write, wire, or contact:

RCA Electronic Components and Devices, Harrison, N.J.

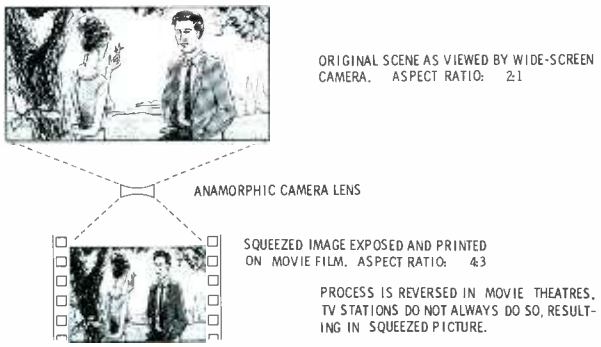
The Most Trusted Name in Electronics

Solution to: Whats Wrong With This Picture?

see page 59

The horizontally-shrunken picture appeared on the TV receiver only when the local station was showing a feature film. During commercial breaks and a live news show, normal pictures appeared. A phone call to the station confirmed our guess that the feature film was a wide-screen production. It had been filmed in a 2-to-1 aspect ratio, rather than the normal 4-to-3 ratio of television. The station's projector used a lens that did not compensate for the difference in aspect ratio, and as a result the transmitted picture was not linear. When commercials or live shows were transmitted, utilization of the proper aspect ratio produced linear images on the receiver screen.

The sketch illustrates the process used in making wide-screen movies. Camera aperture has an aspect ratio of the standard movie film. The reverse of this process is used in theatres and the projected image fills the 2-to-1 screen. Some TV stations, when showing these films, simply expand the images and cut off picture information in the left- and right-hand sections. Occasionally, this is not done, and the image is transmitted compressed.



CHANNELIZER

PAVES THE WAY TO ADDED PROFITS

With Simplified FM-Multiplex Servicing

Sencore has done it again—introduced the right instrument at the right time at the right price. FM-Stereo Multiplex is here, now, and growing as fast as Color TV. This new field is just waiting for qualified men. All you need to start "channelizing" profits your way is the new Sencore Econoline MX11 Channelizer Multiplex Generator. So light and compact you take it with you on your TV service calls, and when in the home suggest an alignment on that FM-Stereo hi-fi in the corner.

So simple to operate, you need no other instrument. Just hook up the RF output cable to the receiver antenna terminals; connect the two speaker leads in place of the speakers; then read the channel separation directly on the meters. Two meters with built-in loads substitute directly in place of speakers. When you flick on the left channel switch you have left channel output; now flip on the right channel switch and you have both. That's all there is to it.

All solid state circuitry—battery operated. Feature for feature, dollar for dollar, the Sencore MX11 Channelizer is your No. 1 buy in multiplex generators. Sencore has paved the way—so take the quickest road to your distributor. In stock now for only .....

$99.50
(Less than the price of a kit.)

SENCORE MX129 FM STEREO MULTIPLEX GENERATOR AND ANALYZER

A Complete FM Stereo Service Center

The ultimate in multiplex generators for this field that's growing as fast as color TV. Like having your own FM stereo transmitter on your bench or service truck.

The MX129 produces all signals needed for trouble-shooting and aligning the stereo portion of the FM multiplex receiver. It is a complete trouble-shooting analyzer with a sensitive transistorized AC voltmeter calibrated in peak to peak volts and decibels. It can be used as a stereo demonstrator even when no stereo program is being broadcast. With the MX129 you can use external sources to modulate the carrier, re-balance the system at any time, and adjust the crystal controlled pilot signal to any level. Instantaneous warm-up—all solid state, A.C. powered.

The Sencore MX129 gives you features comparable to equipment costing up to $350.00, yet its priced at only **$169.50**

SENCORE

NO. 1 MANUFACTURER OF ELECTRONIC MAINTENANCE EQUIPMENT

426 SOUTH WESTGATE DRIVE, ADDISON, ILLINOIS 60101

Circle 25 on literature card

Funny Fable —But True

The serviceman was called by the housekeeper in a rectory who reported that the color receiver had pulled the antenna lead in through the window all by itself and then erupted in smoke.

The good father who lived in the rectory was somewhat of a do-it-yourself bug, and had constructed a wiring nest on the back of the receiver to keep the lead-in off the floor. The set was an automatic set which had a manual tuning channel selector knob protruding from the back. The 300-ohm lead-in became tangled on the channel selector shaft, and began winding around it. This pulled the lead-in through the window until all the slack was removed, at which time the motor powering the automatic portion of the tuning overheated and smoked.

The good father, being somewhat of a wit, said that as he sat there watching this happen he had visions that any moment he was going to see a double-stacked conical come through the window.

—*Jack Clouse*

the instrument with endless uses...the all new improved completely solid state

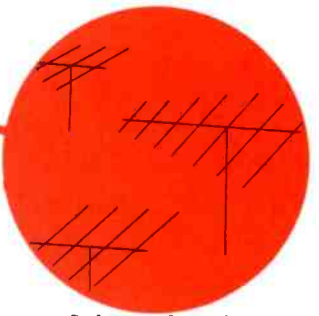
SENCORE FS134 FIELD STRENGTH METER

HERE ARE JUST A FEW OF THE MANY USES...

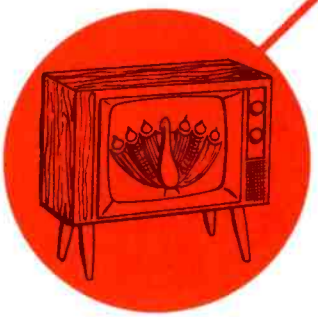
A. Distribution Systems

D. Transmission Lines

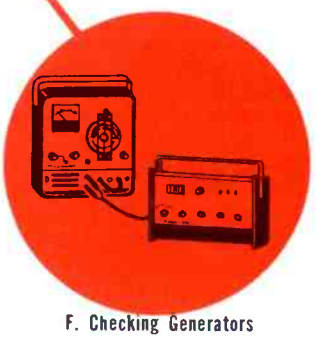
B. Antenna Installations



E. Antenna Comparisons



C. Color Insurance



F. Checking Generators

only

199.50

lowest price going

A. INSTALLING AND CHECKING OUT DISTRIBUTION SYSTEMS

Qualify for this multimillion dollar business in hotel, motel, and hospital installations.

B. INSTALLING UHF, VHF, AND FM ANTENNAS

Cut down installation time and pay for the FS134 in a short time on critical UHF as well as VHF and FM antennas.

C. COLOR INSURANCE

Be sure the signal is adequate on each channel for proper color TV operation.

D. CHECK TRANSMISSION LINES

For the first time read actual db loss in either 75 or 300 ohm transmission lines.

E. COMPARE ANTENNAS

For actual db gain; see which is best for each location, both VHF and UHF. Also excellent for orienting "dishpans" for translator use at the high end of UHF band.

F. CHECK ANY GENERATOR OUTPUT

For correct frequency and output all the way up to a tenth of a volt RMS. What a time saver when you want to know if your generator is putting out.

PLUS: LOCALIZE NOISE AND INTERFERENCE

Find noise source fast; pick quiet locations for antenna installations or orient antenna away from noise when possible.

These are only a few uses of this UHF-FM-VHF accurately microvolt calabrated field strength meter. You can start paying for the FS134 tomorrow in the time saved today — if you see your Sencore distributor now. Why not pick up the phone and ask him to show you the new FS134?

SENCORE

NO. 1 MANUFACTURER OF ELECTRONIC MAINTENANCE EQUIPMENT

426 SOUTH WESTGATE DRIVE, ADDISON, ILLINOIS 60101

Circle 27 on literature card

Scanner

(Continued from page 17)

He noted that, according to a U.S. Department of Labor study, America's demand for technicians is expected to increase by more than 75% by 1975, and that at the present training rate there would be a shortage of 350,000 technicians by that year.

"It is to expand and accelerate the training of such technicians to meet this critical need," he said, "that Bell & Howell plans to bring its experience and resources into this important field in alliance with DeVry Technical Institute.

Breaks Ground

More than 30 state and local officials took part in groundbreaking ceremonies on May 27th, at the 25 acre site of **Viking's** new coaxial cable facility in Freehold, New Jersey.

The Viking plant in Freehold will have a production area of over 130,000 sq. ft., and will manufacture wire and cable for CATV and other communications industries. In addition to coaxial cable, Viking Industries, Inc., also manufactures Solid-State amplifiers and other electronic components for CATV. Other Viking services include engineering and construction of complete CATV systems.

Home VTR

General Electric's solid-state color video recorders for the home were recently introduced at the Music Show in Chicago. System shown is a console color video recorder with built-in 25-inch color television screen, color video tape deck and monochrome home video camera.

CG138

CG10

It's time you too switched to Sencore and saved $100 in the bargain. The new LO-BOY is a solid Sencore value — already selling at the rate of one every 8 minutes.

Small wonder. The LO-BOY outperforms the highest priced unit on the market . . . and gives you all this: • Ten standard RCA licensed color bars; NTSC phased colors. • All the patterns found on more expensive generators—crosshatch, individual vertical and horizontal lines, and adjustable white dots . . . all at the flick of a switch. No lines missing on crosshatch—14 horizontal and 10 vertical, same as our more expensive models. • Interlace control—a Sencore "first." Stops dot bounce that varies from set to set. • Rugged all steel construction with tough scuff-resistant vinyl finish. • LO in silhouette—not much bigger than a cigar box. • LO in warm-up time. All solid state design. • LO in troubles. All new **patent pending** counting circuits using new silicon transistors. Crystal controlled timers for the utmost in stability.

Timer controls brought right out on the front panel as simple operators controls. Adjusted as easily as the horizontal and vertical hold controls on a TV set, if they should ever jump. Absolutely eliminates timer instability.

Compare these features and you'll decide in less than 8 minutes that you need a new Sencore Lo-Boy.

SENCORE CG10. All solid state. New zener regulated battery power supply with long life "C" cells. The 12 volt battery supply can wear down to nearly 9 volts before the circuits are affected. New leakproof battery holders permit easy battery replacement without dismantling the unit. You don't have to hunt for a place to plug it in. Priced at less than the cost of a kit. .....Only **$89.50**

SENCORE CG138. A performance giant just like the CG10 except AC operated with a zener regulated power supply for added stability even with line voltage variations. Has 4.5 mc crystal controlled signal for fine tuning as recommended by color set manufacturers. .....Only **$109.50**

Every 8 Minutes of Every Business Day

SOMEONE BUYS A NEW SENCORE LO-BOY

STANDARD COLOR BAR GENERATOR

See America's most complete line of professional test instruments — at your Distributor's now.

SENCORE

NO. 1 MANUFACTURER OF ELECTRONIC MAINTENANCE EQUIPMENT

426 SOUTH WESTGATE DRIVE, ADDISON, ILLINOIS 60101

Circle 29 on literature card

Patents Awarded

A United States Patent for an "Automatic Degaussing" circuit used in color-television receivers has been awarded to Leonard Dietch, director of engineering for the color-tube division of **Admiral** Corporation.

Currently being used in Admiral color-TV sets, the invention keeps the picture tube free of picture impurities caused by magnetic-field effects, utilizing the power charging current to establish a demagnetizing effect.

Zenith Radio Corporation announced it has received basic patents on its stereo-FM system now in use by more than 470 FM stations throughout the country and incorporated in most radio-phonograph console instruments and FM tuners now on the market.

The Zenith system, developed by a team of company research scientists and engineers and air-tested over Zenith's pioneer FM station, WEFM, was approved by the Federal Communications Commission, with minor modifications, for general use in 1961.

The company said that to foster the continuing growth and development of the FM industry, licenses under the basic Zenith stereo-FM patents will be available to equipment manufacturers on a reasonable royalty basis.

Since its introduction, stereo-FM broadcasting has grown from fewer than 60 stations at the end of 1961 to more than 470 in the U.S. alone, with an estimated 50 stations using the system in other countries.

It is estimated that more than two million instruments equipped to receive stereo-FM will be sold this year.

Potpouri

International Telephone and Telegraph Corporation announced a licensing agreement with **RCA** under which an ITT subsidiary receives nonexclusive rights to manufacture and sell RCA-type color-television picture tubes.

The agreement covers existing RCA types of color picture tubes, such as the popular 25-inch rectangular, 21-inch round, and 19-inch rectangular sizes and all color picture tubes which RCA may develop.

Initial manufacture of the ITT-produced color tubes is scheduled to begin in Germany in late fall of 1966 at the Esslingen plant of ITT's subsidiary, Standard Electrik Lorenz, near Stuttgart.

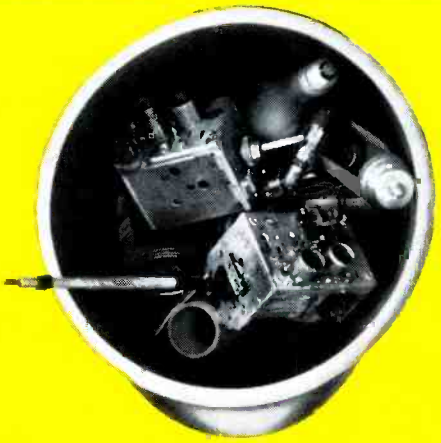
Broadcasting of color-television programs is expected to start in Germany in the fall of 1967, to be followed shortly in the United Kingdom.

The Radio Corporation of America announced a development in rectangular color picture tubes which provides optimum color reception almost immediately after the set is turned on and the picture appears on a TV screen.

This has been achieved by a temperature-compensated, shadow-mask assembly which overcomes the problems of heat expansion during the period in which the picture tube is warming up. This eliminates the usual warm-up time before adjustments can be made in the factory or by servicemen in the home and means greater ease of installation.

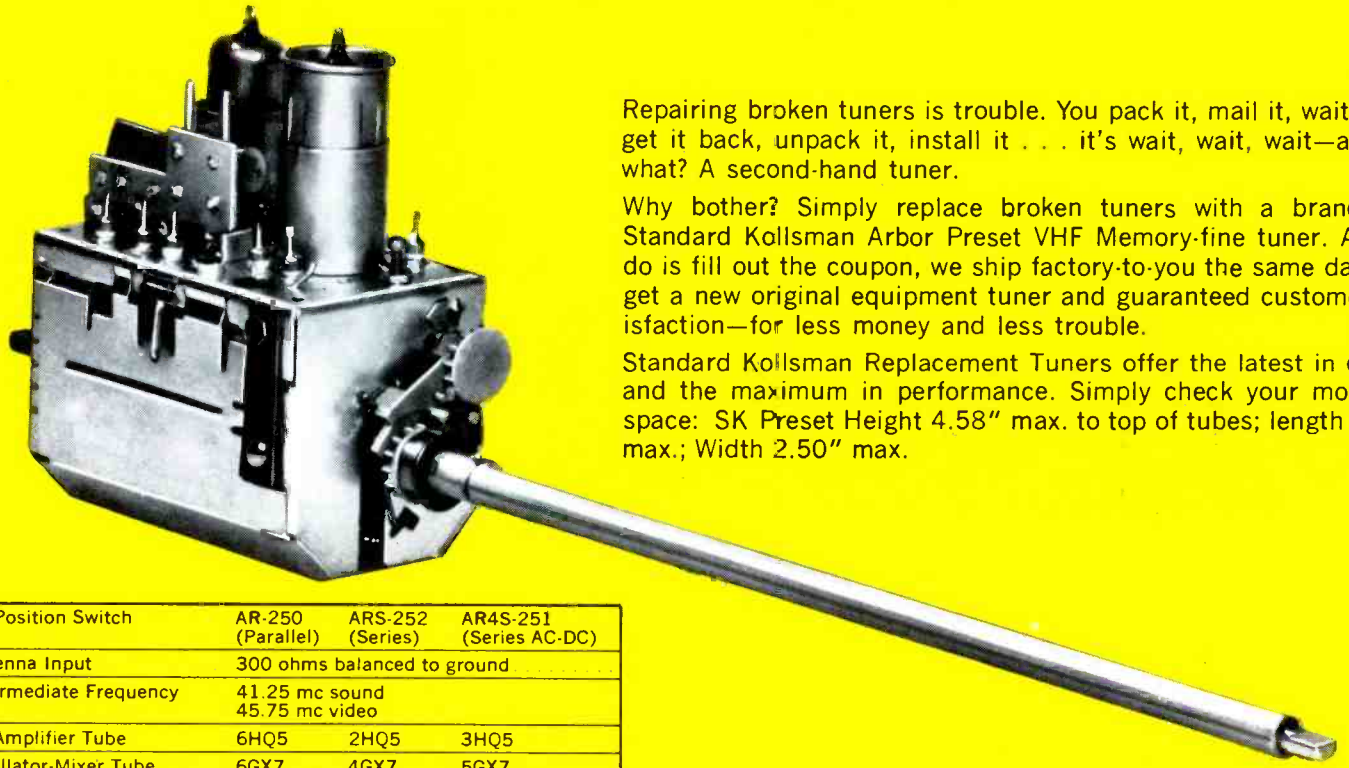
The new development will be incorporated in all RCA 25-, 19-, and 15-inch rectangular color tubes and will be marketed as RCA "Perma-Chrome" tubes.

The Newburgh, N. Y. City Public Schools recently concluded a contract for a 2,500-MHz instructional TV net-



Scrap it!

WHY BOTHER REPAIRING IT...WHEN YOU CAN REPLACE IT FOR ONLY $10.95?



Repairing broken tuners is trouble. You pack it, mail it, wait for it, get it back, unpack it, install it . . . it's wait, wait, wait—and for what? A second-hand tuner.

Why bother? Simply replace broken tuners with a brand new Standard Kollsman Arbor Preset VHF Memory-fine tuner. All you do is fill out the coupon, we ship factory-to-you the same day. You get a new original equipment tuner and guaranteed customer satisfaction—for less money and less trouble.

Standard Kollsman Replacement Tuners offer the latest in design and the maximum in performance. Simply check your mounting space: SK Preset Height 4.58" max. to top of tubes; length 3.61" max.; Width 2.50" max.

13 Position Switch	AR-250 (Parallel)	ARS-252 (Series)	AR4S-251 (Series AC-DC)
Antenna Input	300 ohms balanced to ground		
Intermediate Frequency	41.25 mc sound 45.75 mc video		
RF Amplifier Tube	6HQ5	2HQ5	3HQ5
Oscillator-Mixer Tube	6GX7	4GX7	5GX7
Heater	6.3 volts	600 ma	450 ma
B Plus	125-145 volts dc		

REMEMBER THESE STANDARD KOLLSMAN EXCLUSIVES

Memory Fine Tuning • Direct UHF Plug-in for Fast Replacement on 82-Channel Sets • Universal Mounting • 100% American Made • Preset Fine Tuning • Outstanding Oscillator Frequency Stability • 3-Position Detent Turret Switch for Positive Lock-in Tuning • Fits Most T.V. Sets Produced From 1956 to Now

SK Standard Kollsman
INDUSTRIES INC.
2085 NORTH HAWTHORNE AVE., MELROSE PARK, ILLINOIS

Just fill out this coupon and enclose it, along with payment, for same-day shipment of your order.

Please rush _____ SK Arbor replacement tuner(s) at $10.95 each

Quantity _____ Check ☐ M.O. ☐
(Illinois customers add 4% tax)

Name _____

Company _____

Address _____

City _____ State _____ Zip _____

Zowie! Here's big news for "Mister Right"—the independent service dealer who carries Sylvania tubes.

Every time you order Sylvania picture or receiving tubes from a participating distributor, you receive Sylvania Means Business (SMB)-Mister Right dealer certificates. They're redeemable for an exciting selection of gifts. For yourself, your family, your home.

You get certificates for your purchases of receiving tubes and every SILVER SCREEN 85®, *color bright 85*™ or COLOR SCREEN 85 picture tube.

So you're a winner in two ways: big profits and top-quality prizes. Sylvania Means Business.

See your participating Sylvania Distributor for all the details. Sylvania Electronic Tube Division, Electronic Components Group, Seneca Falls, New York 13148.

SYLVANIA

SUBSIDIARY OF
GENERAL TELEPHONE & ELECTRONICS GT&E

Circle 32 on literature card

work to start broadcasts this fall to all 500 classrooms in the city's 25 public, private, and parochial schools.

The total system contract, including engineering, equipment, and installation, has been awarded to the Micro-Link Systems activity of **Varian Associates.**

The instructional TV network will utilize two channels in the 2,500-MHz microwave range for enrichment telecasts to the city's 15,000 pupils. Specific curricula areas for all grades include science, mathematics, and foreign languages.

The broadcasts will radiate over the 35-square mile metropolitan area from a single 220-foot tall self-supporting tower next to studios housed in Newburgh Free Academy.

The Acoustic Products Division of **The Teltex Corporation** will move into a major new manufacturing facility in Glencoe, Minnesota, on August 1, 1966.

The modern, 36,000-square-foot structure will include complete air-conditioning and heating, dust and humidity controlled atmosphere, and high-intensity lighting for fine assembly. It will contain the most up-to-date equipment for high speed coil winding, molding, and toolmaking, and incorporates the latest manufacturing facilities and techniques.

Teltex is one of the pioneer manufacturers of hearing aids and acoustic devices.

Texas Instruments Incorporated has awarded a contract to construct a 140,000-square-foot manufacturing plant on its 200-acre site, 14 miles from downtown Houston.

The TI plant, scheduled for occupancy early in 1967, will be used for manufacture of industrial equipment and scientific instruments such as are now made by the Industrial Products Group in Houston.

Mergers and Acquisitions

Clarostat Mfg. Co., Inc., announced that the Board of Directors approved a contract authorizing the acquisition of Solar Manufacturing Corporation as a wholly owned subsidiary of Clarostat. The exchange will be made on a share-for-share basis as a result of which Clarostat will issue 81,500 shares of its common stock.

Solar is a manufacturer of electronic components, principally ceramic capacitors, which are used primarily in the consumer-products field.

Switchcraft, Inc., has purchased all production tools, equipment, materials, and inventory of the Muter Division, The Muter Company, to manufacture a complete line of quality slide switches.

Production equipment, tooling and inventory have been transferred to Switchcraft's manufacturing facilities, and production of Switchcraft slide switches will begin immediately.

The marketing of the Switchcraft slide switches will be handled by the company's established network of sales representatives.

Money Matters

Sylvania Electric Products Inc. has reported that actual orders for new home entertainment products taken at its recent National Dealers and Distributors Convention were 108 per cent greater than a year ago.

John T. Morgan, President of Sylvania Entertainment Products Corp., a marketing arm of the company, said orders at the convention were higher in every category of

Sylvania's lines of television sets, stereophonic instruments and radios. Mr. Morgan said orders were particularly strong for color TV, adding that "there are no indications of any build-up of color TV inventory at the retail level." "Additional orders for the new 1967 sets are being received daily," Mr. Morgan said.

Zenith Sales Corporation announced that distributor orders placed at the company's recent sales meeting were the highest in company history.

L. C. Truesdell, Zenith Sales Corporation president, said total dollar value of orders placed for the period June through August was 'well over $200,000,000."

"Total TV orders," Truesdell reported, "were at new peaks for the sixth consecutive year, with color volume over double the comparable 1965 figure."

Failures Show Downturn

The **Electronic Industries Association's** Credit Committee reported at EIA's 42nd Annual Convention that for the first time in recent years, business failures in the electronics industry showed a downturn.

Quoting figures compiled by the National Credit Office, the committee reported a "full measure of improvement" in the rate of failures at both the manufacturing and distributing levels.

Companies failing decreased 35%, while the value of liabilities moved down sharply by 42%, according to the committee. Manufacturers of electronic components and instruments were involved in the highest number of failures. Among distributors, the dealer-servicemen were most beset by financial difficulties.

Major causes of failure, as in the past, were: Poor or inexperienced management; incompetent handling of finances; and inability to isolate loss lines and shift to more profitable ones.

Sales Up

Philco reported the highest six-month sales in the history of the corporation.

Corporate sales of the Ford Motor Company subsidiary increased 31.8 per cent over first-half 1965 while profits continued to build at an accelerated pace. Philco became profitable in June, 1965, and has reported a profit each month since then.

The Consumer Products Group had a first half sales increase of 31.5% while the Electronics Group increased sales 27.2%.

The Consumer Products Group ended the half with a sales convention in Hawaii that produced more than $50 million in orders, far and away the best consumer products dealer convention in Philco's history.

Distributor to dealer first half sales increased 143% in console phonographs, 116% for color television, 28% for portable phonographs, 27% for black and white television and 7% for radio.

While sales gains in the Appliance Division were lower than those in the Consumer Electronics Division, the rate was rising rapidly by the end of the period and in June dollar sales of appliances to dealers exceeded June 1965 by 35%.

▲

ONLY $10 PER MONTH Brings You 20% MORE PHOTOFACT Coverage!

JOIN THE NEW PHOTOFACT® OF-THE-MONTH CLUB!

MORE CURRENT MODEL COVERAGE EACH MONTH TO KEEP YOU AHEAD AND YOU SAVE OVER $60 PER YEAR!

As a PHOTOFACT-OF-THE-MONTH CLUB member you get **6** new PHOTOFACT Sets every month packed with the time-saving, profit-boosting servicing help you need. To stay ahead, to save money (individually purchased Sets now sell for $2.50 each)—join the PHOTOFACT-OF-THE-MONTH CLUB now!

HERE'S THE KIND OF PHOTOFACT COVERAGE YOU GET IN A TYPICAL MONTHLY "PACKAGE"

(6-Set release, September 1966)

20% MORE COVERAGE THAN EVER BEFORE:

8 COLOR TV FOLDERS

13 B&W TV FOLDERS

31 OTHER FOLDERS

(AC-DC, FM-AM, Stereo Hi-Fi, Record Changers, Phonographs)

COMPLETE CURRENT COVERAGE OF AT LEAST 50 CHASSIS EACH AND EVERY MONTH FOR ONLY

20¢ per folder!

(less than 1⅓¢ per page of invaluable servicing know-how)

TRY A THREE-MONTH SUBSCRIPTION!
USE THIS HANDY ORDER FORM

A great monthly "package" exclusively for Photofact of-the-Month Club Members...

You get your 6 new PHOTOFACT Sets every month in sturdy new file folders sealed in factory carton to ensure perfect condition and completeness—easier-than-ever to file and use. Now you get 20% more coverage and save over $60 per year with a PHOTOFACT-OF-THE-MONTH CLUB membership!

TRY A THREE-MONTH SUBSCRIPTION

save on Photofact—watch it boost your earnings

See your Sams Distributor or send Membership Form below:

HOWARD W. SAMS & CO., INC. Dept. PFF-9
4300 W. 62nd St., Indianapolis, Ind. 46206

Enroll me for a 3-month membership in the Photofact-of-the-Month Club. I agree to pay $10 per month, and understand I will receive 6 current Photofact Sets monthly for 3 months to be delivered by my Sams Distributor (named below).

Name_____

Shop Name_____

Address_____

City_____ State_____ Zip_____

My Sams Distributor is:_____

_____

Signed:_____

Book Review

Solving TV Tough-Dogs (TDM-2): Revised Edition; Robert G. Middleton, Howard W. Sams & Co., Inc., Indianapolis, Indiana, 1966; 160 pages, 8½" x 5½", Paperback; $3.25.

This text is a new, enlarged edition of a book that provides the TV serviceman with tried and proved methods of dealing with that troublesome and time-consuming problem—the tough-dog. The effectiveness and applicaton of these techniques have been expanded in this revised edition to include color receivers and all-transistor portables, two receiver types which seem to contribute more than their share of tough-dog problems.

Chapter 1, which lays bare the varied causes of tough-dogs, now includes a discussion of transistor circuitry, pointing out the reasons why they do not always respond to conventional service methods. In Chapter 2, the troubles which cause a "no-picture" condition now include those in color TV receivers. Also added in this chapter are discussions of snow reproduction, built-in troubles, and a comparison of forward and conventional AGC. Integrated circuits, reluctant oscillator-neutralization in transistor sets, and color-tuner AFC circuit problems have been added to the "poor-picture" troubles discussed in Chapter 3.

"Framing and display troubles," the topic of Chapter 4, now include those found in varactor circuits. The causes of raster problems in portable receivers and horizontal sweep circuits have been added to Chapter 5. Buzz and other video-sound problems are covered in Chapter 6.

Actual examples of tough-dog servicing problems and step-by-step solutions are outlined in a clear and practical manner. In addition, the "whys" of many problems have been stressed so that the knowledge gained from this informative text will be equally useful in dealing with a broad range of service problems. ▲

Antenna Systems

(Continued from page 35)

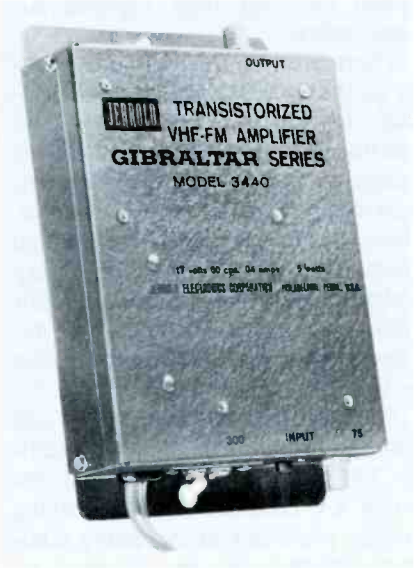


Fig. 4. Solid-state line amplifier.

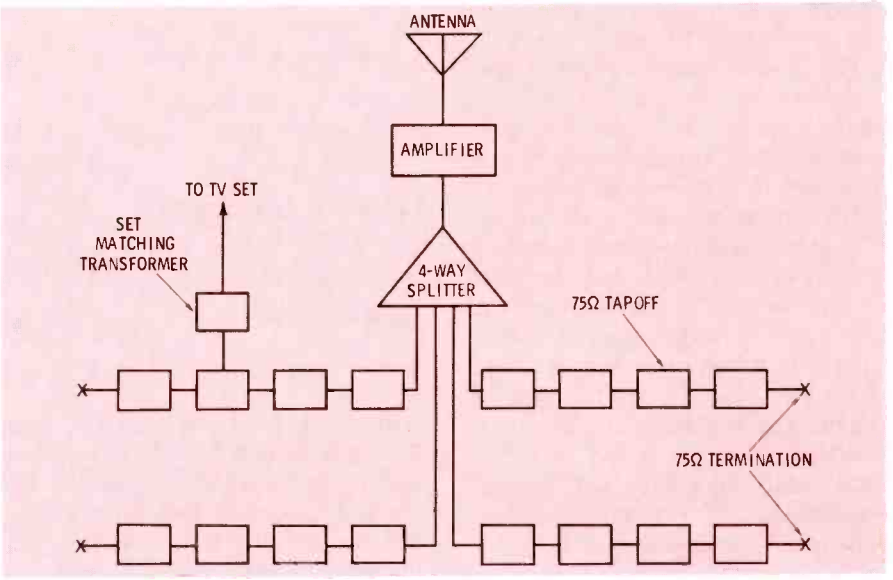


Fig. 5. Typical TV showroom system providing 16 tapoffs.

amplifier with more output will probably be required. If the building is under construction, the feeder lines are run behind the walls, often through conduit. Otherwise, they can be run outdoors or through closets or airshafts. Where practical, flush-mounted tapoffs, which fit into any electrical outlet box, should be used.

The number of outlets you can connect to each feeder line depends on the type of outlet you use, the characteristics of the amplifier, and the strength of the antenna signal. However, the small, solid-state amplifiers, such as the one shown in Fig. 4, will easily handle six or seven

outlets on each of the feeder lines, provided the antenna is picking up enough signal to supply a good picture to a single TV set.

Fig. 5 shows a typical TV showroom system. Notice that 75-ohm output tapoffs are used with separate matching transformers. This is necessary in a showroom system to eliminate the possibility of ghosts. This system will handle virtually any TV showroom and will provide enough outlets for every set on the sales floor. In fringe areas, of course, a preamplifier will be required ahead of the amplifier. To sell this type of system, you will have to make up a standard package, based on your costs and the estimated annual maintenance of the system. Here is a typical package estimate:

1. Antenna	$ 20.00
2. Mast, mount, hardware, etc.	20.00
3. Broadband solid-state amplifier	50.00
4. 4-way splitter	9.00
5. (16) tapoffs @$2.40 each	38.40
6. (16) matching transformers @$2.00 each	32.00
7. 300′ of RG-59/U @$5.00/100′	15.00
Total	$184.40
Labor (12 hours @$5 per hour)	60.00
Total Cost	$244.40
Mark-up	105.60
Selling Price	$350.00

It should be fairly easy to sell a 16-outlet system for $350. You can add up to 12 additional outlets for about $7.50 each. This price should include a full year's warranty on the system. You can expect one or two callbacks to get the bugs out of the system and to indoctrinate the dealer salesmen in its proper use. For subsequent years, you can offer the dealer a service contract for about $25.00 to $50.00 per year. Actually, since this is a solid-state system, it will require very little maintenance if it is carefully installed. Replacement of connectors and matching transformers should be your only expense for many years.

There are a number of side benefits to the multiple TV system business. In the case of motels and apartments, it's usually easy to sell a contract for TV receiver maintenance along with the system contract. This can be an important added source of revenue. Also, it is very probable that the homeowner for whom you have installed an antenna system will call you first when he has TV troubles.

Far less formal knowledge and skill are required to install a multiple TV antenna system than to repair a TV receiver. Help in solving specific problems or designing complex systems can be obtained by calling or writing one of the leading system equipment manufacturers. Their applications engineers will generally give you the help you need, without charge.

The multiple TV system market is ripe. The technician who puts forth the effort to get into this promising field will find it profitable. ▲

The Troubleshooter

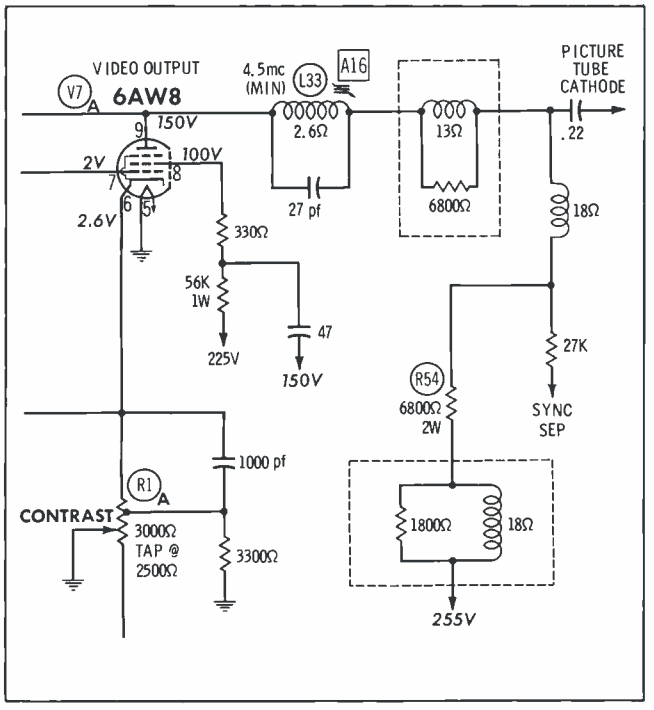
answers your servicing problems

Hot Resistor

I have recently run across an interesting problem in an RCA Chassis KCS98AC (PHOTOFACT Folder 347-14.) After 15 or 20 minutes of operation the set would suddenly lose both horizontal and vertical sync. The trouble was caused by a change in value of the video-output load resistor R54 and apparently was the result of self-created heat. The resistor was mounted nearly flush with the circuit board and air circulation around the component was reduced. The problem was solved by increasing the length of the resistor leads enough to set the component about an inch above the circuit board to allow air to circulate around it. After this was accomplished, the set operated normally.

ELMER COOK

North Highlands, California



Looking at the picture of the video-output printed board in PHOTOFACT, I noticed that resistor R54 is neatly boxed in by two large capacitors and two coils. This probably contributed to the heat build-up.

Record-Changer Information

I am repairing a Philco Model E-1370-124 radio-phonograph, but cannot find any information on the record changer. The radio is covered in PHOTOFACT Folder 359-

11; however, no information is given concerning the record changer.

RAY LOWEN

Inola, Okla.

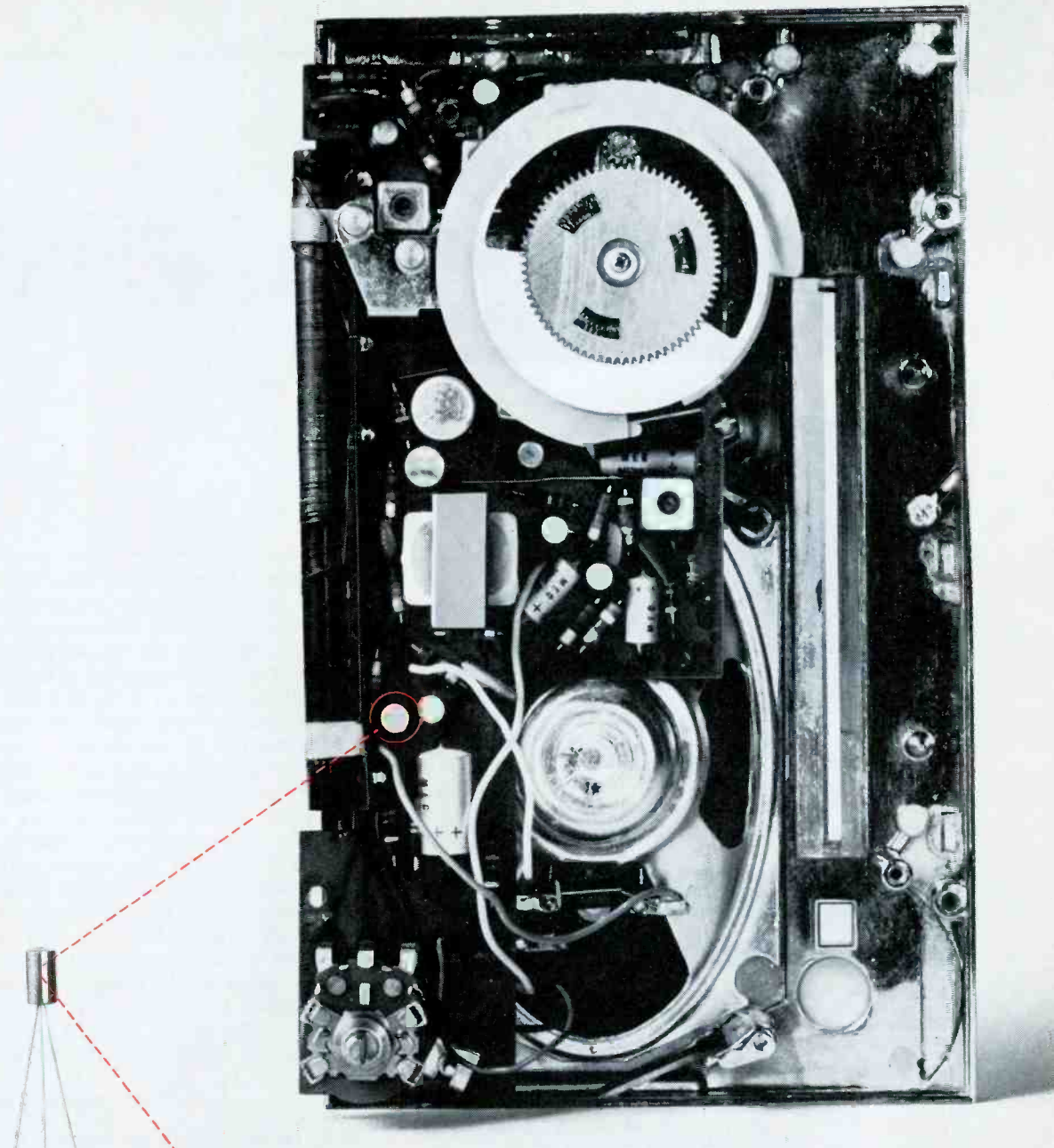
The record changer used in this particular radio-phonograph is Philco Model M-38. The information you desire can probably be obtained from Philco. We regret that there is no PHOTOFACT *coverage of this record changer. To provide* PHOTOFACT *coverage of any TV, radio, phonograph, or record changer, it is necessary that the manufacturer make the item available. Unfortunately, in this case, the specific record-changer model could not be obtained from the manufacturer. The same reason also prevented coverage of this record changer in Howard W. Sams CM series of record-changer and tape-recorder manuals (Volumes 1 thru 9), as well as the three-volume RC series of record-changer data.*

Retrace Lines

I am having no success with a Magnavox TV Chassis V1801CB (PHOTOFACT Folder 348-6) which has retrace lines in the top half of the picture. The lines cannot be removed with the operating controls. The only way the lines can be removed is by decreasing the top half of the picture two inches with the height control. Can you offer any suggestions on the possible cause of this trouble?

TSGT. STEWART A. BARNUM

APO New York 09012



One RCA SK-3004 can replace this transistor and more than 700 other transistors as well!

And it will work! Because RCA SK-3004 is one of RCA's "Top-of-the-Line" series of replacement semiconductors—16 transistors and 2 rectifiers. Each of these top quality replacement semiconductors has been carefully designed for a specific application in entertainment-type equipment. Result: You can quickly choose the one type that will provide top performance in the equipment you are servicing.

All 18 RCA Top-of-the-Line types and the devices they replace—more than 4,000 transistors, foreign and domestic, and more than 1,300 selenium and silicon rectifiers—are listed in RCA's Replacement Guide, SPG-202A. You should have a copy handy if you service solid-state entertainment-type equipment. Ask your RCA Distributor about it or write:
RCA Commercial Engineering, Section K33SD, Harrison, N. J.
RCA Electronic Components and Devices, Harrison, N. J.

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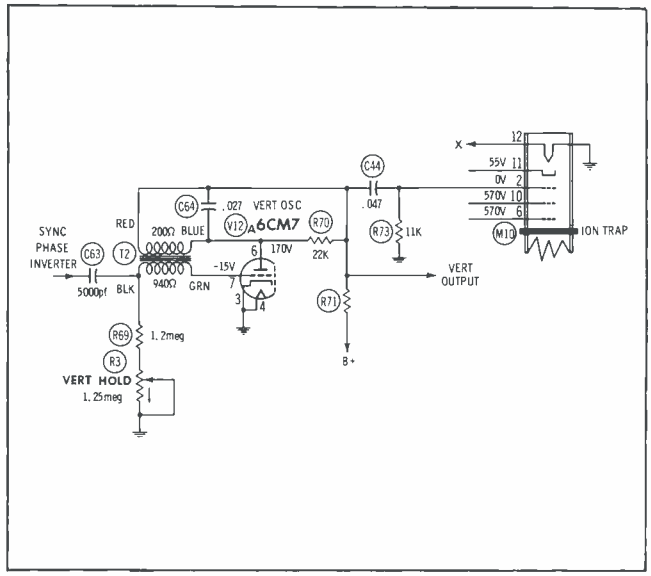
Circle 45 on literature card



The vertical retrace lines you are experiencing on the top half of the raster are probably caused by an open or partially open C44 or a decrease in the resistance of R73. The duration of the retrace pulse is dependent on the values of these components. If C44 is open or partially open, or if the value of R73 decreases, the duration of the retrace pulse is decreased and retrace lines appear on the top portion of the picture. This is true because the retrace blanking pulse begins when the vertical sweep is at the bottom of the picture, ready to begin the retrace to the top. If the retrace blanking pulse is too short, it will decay before the vertical retrace has been completed.

It is doubtful that a faulty component in the vertical-oscillator or vertical-output circuit is causing the trouble because, as you have indicated, the raster is normal except for the retrace lines. Trouble in either of these stages would produce sync, height, or linearity problems.

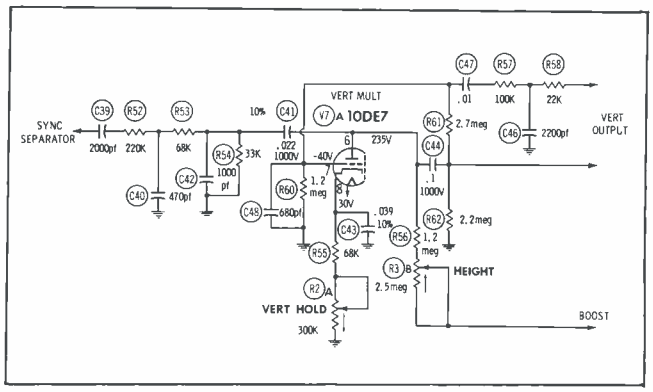
A check of the waveform present on pin 2 of the picture tube will probably reveal a decrease in amplitude of the vertical-retrace pulse. The normal waveform and p-p amplitude are shown in the PHOTOFACT FOLDER.

Vertical Roll

Vertical roll in an Admiral Chassis 15A2 (PHOTOFACT Folder 456-1) has me baffled. The hold control will not stop the roll. Horizontal sync and sound are functioning properly. The set had a habit of kicking out the circuit breaker in the low-voltage power supply; however, a new power choke and circuit breaker remedied this trouble.

J. HAMILTON

Winchester, Indiana



Your description of the vertical roll does not specifically state whether or not the vertical hold control has any effect on the direction of roll. This is an important

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point to consider when troubleshooting vertical sync defects. If the sync defect results in free rolling and the vertical oscillator is indicated, disable the vertical oscillator by grounding the grid of V7A and scope the plate. If the sync pulse is not present or does not have the shape and amplitude of Waveform W7 in the PHOTOFACT *schematic, check the vertical integrator circuit for defects. Coupling capacitors C41 and C39 are probable defects.*

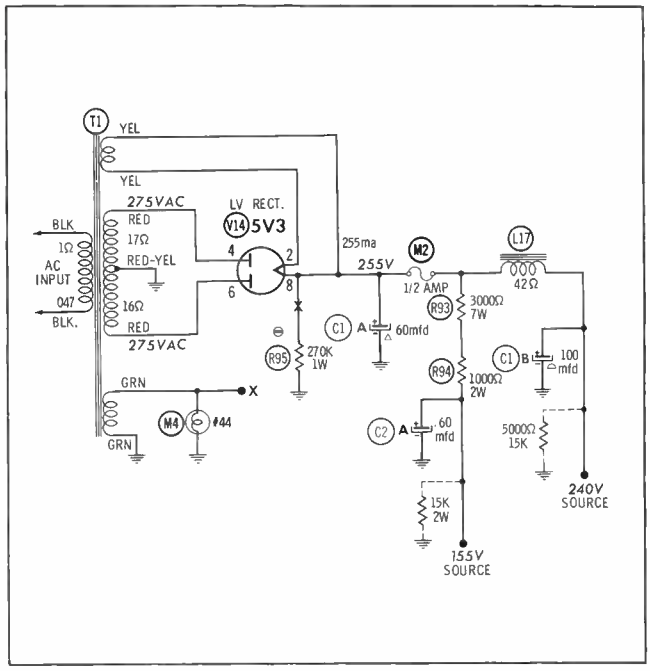
If the direction of vertical roll cannot be changed by the vertical-hold control, an oscillator defect is indicated. It is possible that sync pulses are also absent; however, an oscillator defect must still exist to cause this condition. It is more probable that you will find the sync pulse present and the trouble caused by an open coupling capacitor C41, or a defect in the grid, cathode, or feedback circuits of the oscillator.

Reduced Height and Width

I have an Admiral Chassis 17C1 (covered in PHOTOFACT Folder 397-1) which has reduced height and width. Troubleshooting the vertical, horizontal, and high-voltage circuits has failed to turn up the cause. What could possibly be the trouble?

LANE J. BERTELSEN

Marysvale, Utah



A reduction of both width and height is usually caused by a defect in a circuit or section which relates to both functions. In this case, since the vertical-sweep section does not depend on the B+ boost circuit, the low-voltage power supply is the prime suspect.

Check the low-voltage source voltages. If either or both sources measure low, first check the rectifier tube, then check the filter capacitors by substitution. Bridging them will not be effective in this case, because you will be looking for a slightly leaky capacitor, not an open one. Next check the resistors for a change in value. The power choke seldom fails; however, if it has, a visual inspection will usually reveal this defect. If the trouble has not been found in any of these components, check the power transformer.

If no reduction in B+ is found at the voltage sources, trace each source voltage to the stage it supplies, watching for a decrease in voltage. If a capacitor on the line is leaky, the B+ voltage will decrease beyond the faulty component. ▲

Color Countermeasures

Symptoms & Tips From Actual Shop Experience

Chassis: All chassis (Zenith)

Symptom: When attempting convergence, horizontal blue lines lack enough control at top and bottom.

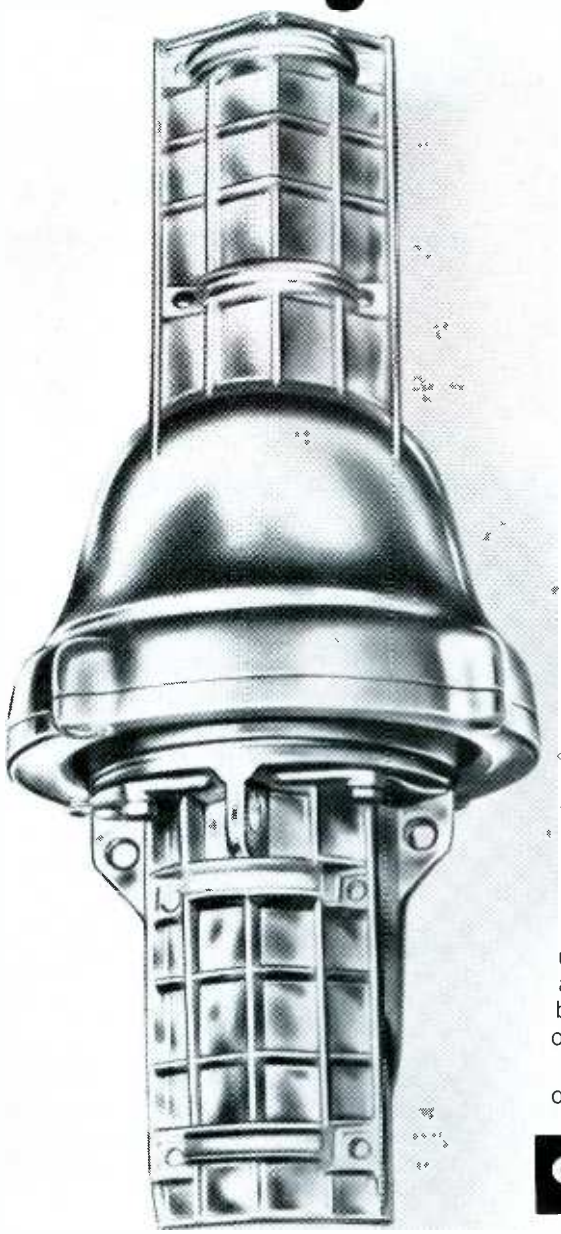
Tip: Replace Vertical Output Transformer.

Chassis: Zenith (all chassis)

Symptom: Intermittent color and brightness. Raster blinks from normal to either bright red, green, or blue.

Tip: Apply different pressures on the tubes associated with suspected circuit. Defective tube sockets and cold-solder joints may be discovered by this procedure.

Never ask a lightweight rotor to do a heavyweight's job.



Selling your customer a lightweight rotor when he has a large antenna array just doesn't make sense. Especially since you can offer him an alternative: the heavy-duty "Bell Series" rotor, from CDE.

Available in both automatic and manual forms, this rotor is designed specifically for large, heavy antenna arrays... designed specifically for unmatched fringe-area reception... designed to give your customers the finest color TV reception possible. In fact, this is the *only* heavy-duty rotor available.

We call it the Bell Series because of its completely weatherproof, die-cast aluminum housing. You'll call it rugged because it has 4 to 5 times the stalling and braking torque of any other rotor! This means *any* antenna will turn, even under the most adverse weather conditions... and that your customers will get terrific color or black and white reception despite high winds or heavy icing. Great FM reception too!

The Bell Series rotor: one-of-a-kind built for one-of-a-kind performance!

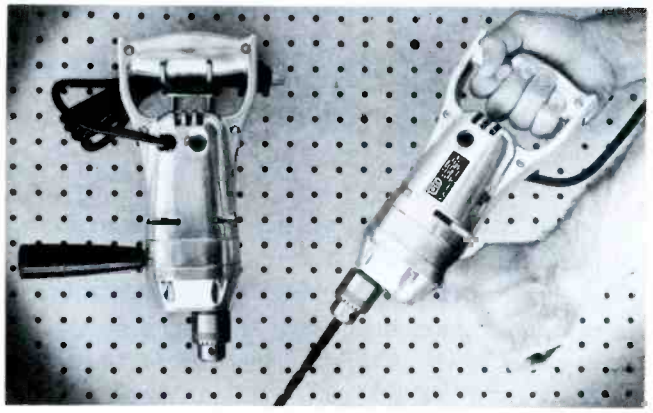
CDE CORNELL-DUBILIER

Circle 50 on literature card

Miniature Soldering Iron

(75)

A new smaller model has been added to the "Little Dandy" line of miniature soldering irons available from **American Beauty.** Model 3108 is a 20-watt unit similar to the 25- (Model 3110) and 40--watt (Model 3112) units developed previously. Features shared by all three models include long-life heating elements with nonceramic insulators, a full range of tip options, and a simple unit construction which permits quick replacement of any part. Model 3108 is priced at $6.00.



Four Speed Drill

(76)

A 3/8" electric portable power drill, featuring solid-state motor control, four speeds, and "D"-type handle, has been introduced by **Wen Products, Inc.**

The new power tool permits the used to drill through a variety of materials and material thicknesses. Speeds at full load, variable by spindle and motor-speed-control switch position, are 1800, 1300, 650, and 450 RPM. The user simply

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Circle 52 on literature card

fastens the chuck into one of the two spindles and uses the motor-speed-control switch. One spindle is for low speed, and the other is for high speed. The three high speeds are for drilling steel of 1/16" to 3/8" thickness; wood of 1/16" to 1/2" thickness; and aluminum, brass, or copper of 1/16" to 3/8" thickness. The lowest speed range is used for steel to 1/2" thickness; wood to 3/4" thickness; aluminum, brass, or copper from 3/8" to 5/8" thickness; and masonry to depths of 1/8" to 3/8".

"The basic versatility of the 3/5" portable electric drill has been measurably increased with the provision of four speeds and the unique 'D' handle and should prove a boon to the home handyman or professional user," according to Wen.

Paging System
(77)

Approval for use in Class I, Group D and Class II, Group G Hazardous Atmospheres has been given to **Motorola** VHF Pageboy Radio Pagers by Underwriters' Laboratories, Inc. These classes represent various vapors including gasoline, naptha, benzene, propane, solvents, natural gas, plug flour, starch, and grain dusts.

Underwriters' approval of this unit enables use of VHF paging in refineries, mills, mines, factories, and hospitals, and other locations with hazardous atmospheres.

In operation, the user carries the small, radio receiver 11½-oz voice model (with U.L.-approved mercury battery) clipped to his pocket or belt. Calls may be originated by a central paging operator, or from individual telephones which connect to the system transmitter. When a call is made, the receiver will emit an alert tone to indicate that the user is being paged. Then the small button on top of the unit is pressed, and a voice message is heard. Since he paging system is selective, only the person for whom the message is intended will receive the call. Depending on system design, coverage may include a relatively small area, such as a refinery, or a large area such as an entire city.

The unit, which measures 5¼" × 2½" × 1 1/16", features an optional adjustable tone level which is valuable to businessmen, doctors, and others who often work in quiet surroundings. As the user adjusts the unit for the desired voice message level, the volume of the alert tone is controlled proportionally. Maximum tone output is 200 milliwatts.

The pager is designed for use in the 148–174-MHz frequency band and will respond to signals as weak as 0.15 mv. Voice sensitivity is less than 0.5 mv for 20-db quieting.

Also available for the new pocket radio is a rechargeable nickel-cadmium battery for use in nonhazardous atmospheres. This battery provides 12 hours of operation per charge. The mercury battery allows 90 hours of continuous operation. Battery life is based on 15 calls per eight-hour period.

Optional matched accessories include multiple and single-unit chargers, carrying case and belt, lapel speaker or earpiece speaker, and antenna accessories for vehicular use. Price of the unit ranges from $227 to $260, depending on accessories and type of batteries desired.

Bulk Eraser

(78)

A new bulk eraser that clears both video and audio signals from magnetic recording tape on reels up to 10½" without rewinding is available from **Robins Industries Corp.** The eraser, Model TM-100, is for home and professional use with Sony and equivalent VTR systems, as well as any comparably sized audio, computer, telemetry, industrial, or special-purpose magnetic tape.

Tape up to 1" wide is cleared in one operation. Tape up to 2" wide can be erased by performing the seconds-long procedure on each side of the reel.

The unit reduces tape noise levels 50 to 90 db below the saturation minimum. Equipped with an overheat indicator and other safety features, the eraser operates on 115-volt, 50/60 cycles AC. The duty cycle is 5 minutes on, 15 minutes off. The unit is priced at $85.00.

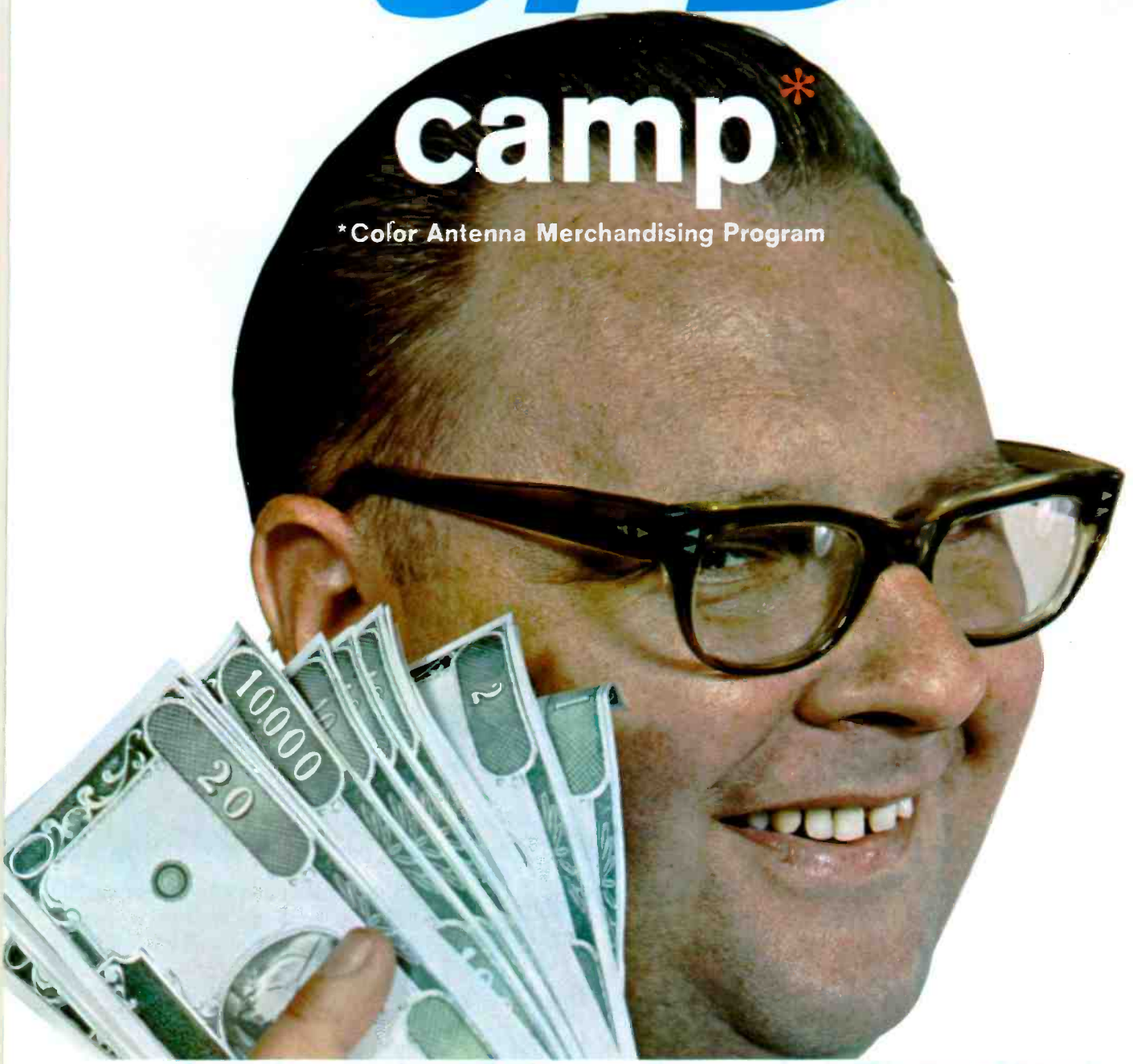
Circle 55 on literature card

Circle 54 on literature card

get with the JFD®

camp*

*Color Antenna Merchandising Program



—the most spectacular retail sales promotion campaign in TV antenna history!

Sure you're doing great selling color TV sets. But if you're skipping the color **antenna** sale that goes with it, you're passing up "beaucoup" profits. Too risky and tricky, you say? That was B. C. (**Before** CAMP) which now "automates" the color antenna sale—earns **you** (instead of your competition) those extra profits. Keeps **customers** happy, too. How? Easy. CAMP coordinates a comprehensive combination of dynamic selling tools that (1) drive home the fact that only a **color**-engineered TV antenna can do justice to the fine reception color TV sets were designed for and that (2) JFD LPV COLOR LPV Log Periodic antennas make color sets work at their very **best.**

Turn the page and see how the JFD CAMP takes the mystery **out** of TV antenna business—and puts back the **profits.**

JUST WHAT IS CAMP? Camp is a popular new expression meaning anything done in a style that is different or unusual enough to be considered "in" and attention-getting—a most apt definition of JFD's own (CAMP) Color Antenna Merchandising Program.

Look at what else

JFD®

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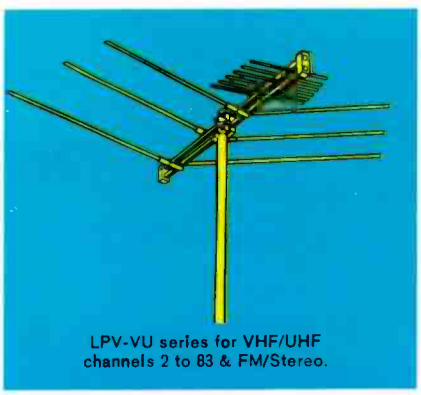
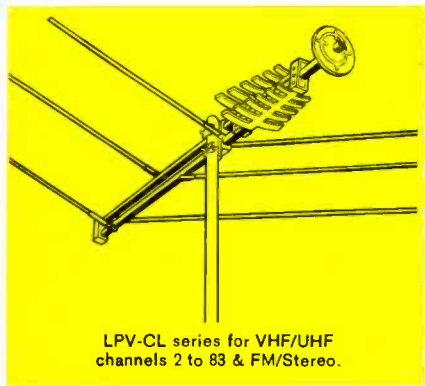
1. Most advanced selections of VHF, UHF, and VHF/UHF/FM antennas. (Also, the most copied.)



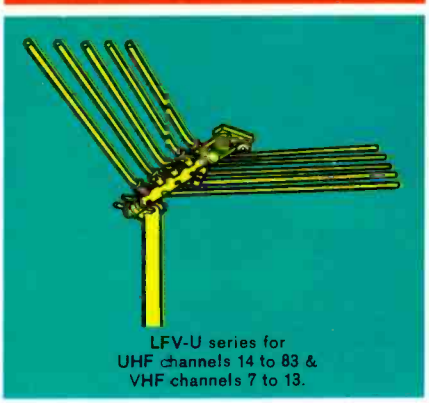
LPV-VU series for VHF/UHF channels 2 to 83 & FM/Stereo.

LPV-L series for VHF channels 2 to 13 & FM/Stereo.

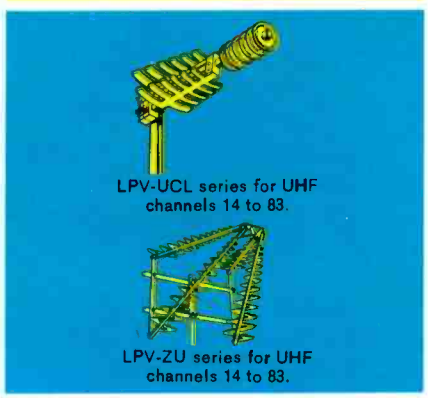


LPV-CL series for VHF/UHF channels 2 to 83 & FM/Stereo.

LPV-TV series for VHF channels 2 to 13 & FM/Stereo.



LFV-U series for UHF channels 14 to 83 & VHF channels 7 to 13.



LPV-UCL series for UHF channels 14 to 83.

LPV-ZU series for UHF channels 14 to 83.

2. Scientific engineering under direction of Dr. Paul E. Mayes (co-inventor) of the Log Periodic Antenna concept.

3. Eleven patents* issued and pending assure you of getting genuine Log Periodic design—not an ineffective imitation.

4. Eight modern Mobile Field Labs continuously research LPV Log Periodic performance in town and country across the U.S.A.

5. Advertised nationally in big space ads in LIFE that pave the way for your local LPV sales.

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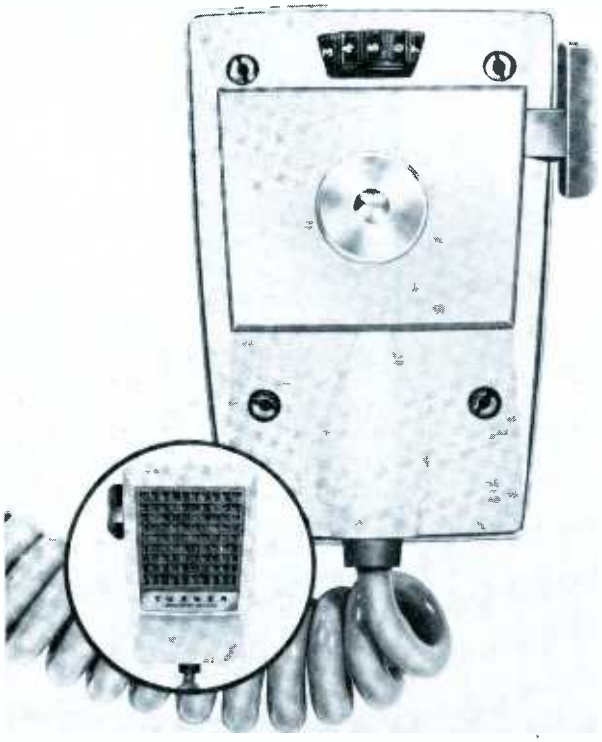

Mobile Microphone

(79)

A self-contained two-transistor pre-amp makes this mobile type microphone particularly adaptable for use with mobile transceivers that require more output, or must work under conditions requiring a variable output level. A volume control, located on the back of the microphone case, permits adjustment of the microphone output level. **Turner Microphone Co.** produced this M+2 microphone.

The frequency-response range of the M+2 is 300 Hz to 3,500 Hz. An electronic switching model is also available, at no extra cost. Complete with battery, dash bracket, and 5-ft coiled cord, the unit costs $39.50.

Color Generator

(80)

This new solid-state color generator features a line-width adjuster which enables the serviceman to select the vertical and horizontal line thickness or dot size of his choice. All calibrations can be made quickly without removing the unit from the cabinet. Introduced by **Mercury Electronics Corp.**, Model 1900 provides separate horizontal and vertical

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101 Ways to Use Your Oscilloscope — New Edition

by Robert G. Middleton. This popular, newly revised working handbook shows latest methods for faster, more proficient servicing using the scope. Explains how to make waveform tests and how to analyze waveforms produced by defective circuits. Includes new material on use of wide-band and triggered-sweep scopes. Covers detailed testing of various sections of both b/w and color TV sets. Describes use of square waves to evaluate circuits and components. Each test described includes information on equipment needed, proper connections, test procedure and evaluation. Heavily illustrated. 192 pages; 5½ x 8½". Order **TEM-2A**, *only* **$2.95**

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by John D. Lenk. The authoritative book on connectors, their uses and selection. Discusses basic design considerations; provides detailed descriptions of connector parts, configurations, construction details, assembly methods, etc. Describes various environmental conditions to which connectors are subjected; explains tests used to check connectors under special conditions. Absolutely invaluable and much-needed data on the entire subject of connectors. 160 pages; 5½ x 8½". Order **ECL-1**, *only* **$3.25**

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bars which swiftly indicate the area of misconvergence. A crystal-controlled keyed rainbow color display is also provided to test and adjust color circuits.

The unit connects easily to the TV antenna, thus eliminating the need of opening the set to make most tests. A high RF output is provided on channels 3, 4, or 5. The unit is factory set at channel 3, and adjustments for channel 4 or 5 can be made without removing the unit from its cabinet.

Additional features include color level control to check color sync circuits, color-coded gun-killer switches conveniently located on the front panel, lead-piercing clips for quick and positive grid connections, voltage-regulated transistor and timer circuits to assure stable operation under wide voltage ranges, line isolation to prevent shock, and a convenient storage compartment for all cables. Price of the generator, including gun killers, is $89.50.

F-M Stereo Multiplex Generator

(81)

This new portable FM-stereo multiplex signal generator is adaptable to service call or laboratory use. Features of the **Kenwood** unit include a built-in audio oscillator which provides internal modulation at either 1000 Hz or 50/60 Hz, and a built-in FM signal generator which produces a 98-MHz (±2MHz) carrier wave. Another feature of the Model SM-109 is a pre-emphasis circuit of 75μ seconds which offers actual demonstration by applying a stereo music signal on the external input terminals. The unit measures 6¾" × 10½" × 10½" and weighs 13 lbs. Price of the instrument is $299.95.

Screen Cleaner

(82)

Static electricity, which seems to be an inherent part of most TV sets, tends to cause a rapid accumulation of dust, particularly on the face of the picture tube. Adding to the problem is the greater circulation of air in the vicinity of TV sets due both to human traffic and heat created by the set.

A new ammonia-base glass cleaner, called Colorclear, contains an antistatic agent which discourages the accumulation of dust on picture-tube screens. The **GC Electronics** glass cleaner is intended not only for serviceman, but also as a resale item on service calls. Price is $1.65.

Driver Unit

(83)

Specially designed to handle high-wattage-speech, electronic-siren, and electronic-foghorn inputs, this new **Atlas Sound** driver unit has a power rating of 75 watts, 16-ohm impedance, and a frequency response from 100 to 8000 Hz. HP-75 is intended for use with Atlas Sound DR Series directional trumpets, but will also fit any industry-standard horn with 1⅜"-18 driver threads. The unit is weather-sealed, corrosion-proofed, and enamel-finished for outdoor use. The unit measures 4 3/8" × 3 9/16" and weighs 4 3/4 lbs. Price is $57.00.

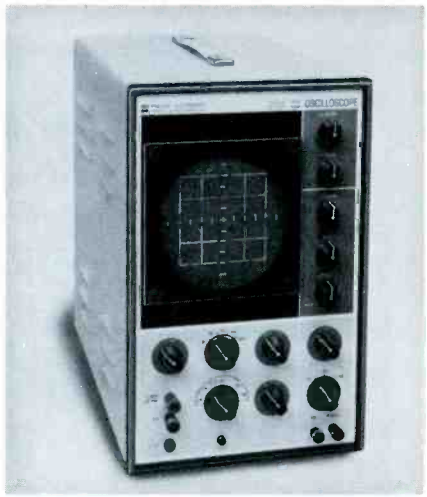
Voltmeter

(84)

A new solid-state true-rms voltmeter with a frequency band of 10 Hz to 20 MHz is announced by **Ballantine Laboratories.** The instrument can be operated from a self-contained rechargeable battery or from a 115/230 VAC, 50–400-Hz power source. Model 323 has a voltage range from 300 mv to 330 volts, with an additional null-indicator range from 100 mv to 300 mv. Accuracy is 2% of reading at frequency from 50 Hz to 10 MHz—better than 1% full scale over the lower half of the scale.

The 5" voltage scales are logarithmic and capable of uniform accuracy and resolution over their entire length in percent of actual reading. The unit is useful in measurements of a wide range of waveforms from sine waves, distorted sine waves, random noises, square waves, or a range of pulses as low as 0.1 msec, having a duty cycle as low as .04.

The battery/line-operated model is priced at $520. Price of the line-operated unit (Model 323-01) is $485.



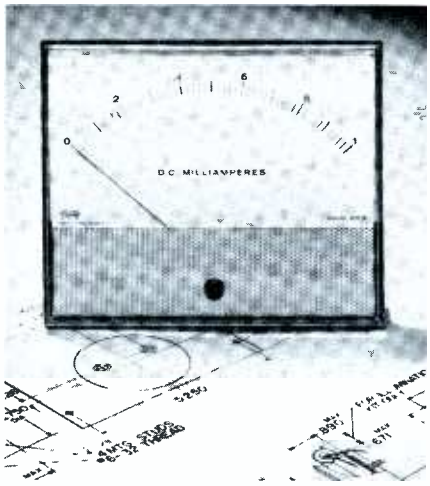
Wideband Scope

(85)

A new wideband 5" oscilloscope for audio and industrial testing as well as TV servicing (b-w and color) has been announced by **Precise Electronics.**

Performance features of the Model 315A include: Vertical response to 5mc with 10 mv rms/cm sensitivity; three-step, frequency-compensated vertical attenuator

with separate stepless control; a two-stage push-pull vertical amplifier, plus cathode-follower input; and a panel-mounted astigmatism control for sharp-trace adjustment. Additional features are a drift-free positioning control which permits full observation of expanded traces; negligible rise-time, overshoot, and square-wave tilt for true display of complex waveforms; and a fully automatic sync that yields maximum stability for all waveforms, completely eliminating the need for manual sync voltage adjustments. Price is $134.95.



DC Panel Meters

(86)

A new line of 5½" DC panel meters, designated Series 520-G, are available as voltmeters, millivoltmeters, ammeters, milliammeters, and microammeters with front-panel or bezel mounting. Introduced by the **Triplett Electrical Instrument Company,** the meters provide flexibility and interchangeability for industrial users and instrument panel designers and are available in a wide assortment of scale ranges, scale divisions, ohms/volt capability, resistances, and special features. Ammeters feature a standard 50-millivolt drop. All meters are either pivot-and-jewel or suspension type construction.

A patented, self-shielded bar-ring magnet is used in all DC meters (including suspension) to provide more torque, faster response, and greater construction ruggedness. Standard accuracy of the compact units is 2% and best accuracy is ½%. Either magnetic or nonmagnetic panel standard calibration may be used. The meter scale length is 5", and the pointer is of the black-lance type. Featuring a phenolic back and acrylic front, each meter is supplied with mounting and terminal hardware. Breakdown voltage is 5,000 volts.

The meters are also available in 550-G AC rectifier, 530-G AC iron vane, and 540-G RF thermocouple types. These options are available to users: behind-panel mounting with a half bezel; flat-scale arc with knife-edged pointers; a front insert which can be custom painted or imprinted with the customer's trademark. Scale mirrors are available and illumination can be provided for the half-bezel type.

The front-panel-mounted units are 5.6"

long by 4.5" high by .6" deep, with four mounting studs (#6-32 thread) which extend in the rear. The meter housing has a 2.75" diameter by 1.4" deep with two electrical terminals (¼-28 thread) extending ½" from the rear. The half bezel for behind-the-panel mounting is rectangular in shape, of black metal, and measures 6" long by 3.3" high. The meters weigh approximately 16 ounces each. Prices of the 520-G Series meters are dependent upon customer meter requirements.

Regulated 500-watt Power Supplies

(87)

Development of a series of solid-state continuously variable, regulated power supplies, delivering 500-watts DC, has been announced by **Electro Products Laboratories.**

Three models, with output ranges of 2 to 32 volts, 2 to 55 volts, and 2 to 125 volts, are designed for continuous, heavy-duty production testing, design use, electronic, and electromechanical circuitry development in industry, laboratories, and schools. They are also intended for aircraft, military, and commercial uses where a regulated DC output is required.

Ripple is less than 1% at maximum rated currnt. Load regulation is less than 1% for both line and load changes. All units have solid-state circuitry with silicon rectifiers and SCR regulation. A

fused input and circuit-breaker output protection is provided. Units feature a one-year warranty.

Panel components include a voltage-control knob, primary fuse, output circuit breaker, on-off switch, two meters, pilot light and "5-way" binding posts. The cabinet is steel and measures 9¾" x 14¼" x 14¼". Weights range from 76 to 80 lbs. Prices range from $375 to $395. ▲

INDEX TO ADVERTISERS

SEPTEMBER, 1966

FREE Catalog and Literature Service

**Check "Index to Advertisers" for further information from these companies.*

ANTENNAS

120. *ALLIANCE* — Colorful 4-page brochure describing in detail all the features of *Tenna-Rotors.**
121. *AMPHENOL CORPORATION* — New 28-page catalog aids selection of RF connectors and coaxial cable. Specifications are detailed for nearly 1400 items.*
122. *ANTENNACRAFT* — Four-color catalog sheet about the new *"Big-Shot-8"* VHF-UHF-FM antenna designed for city and suburban use.
123. *BLONDER-TONGUE* — Compact brochure detailing a line of all-channel products, expressly designed to improve reception in the home and small MATV systems.*
124. *FINNEY* — Form 20-353 about the *Finco-Axial* 75 ohm antenna system for UHF-VHF and FM.*
125. *GC ELECTRONICS*—Catalog NR-5033T on hardware and accessories, Form FR-028-C about all-channel antennas, VHF fringe, and the latest UHF antennas.
126. *JFD* — New 1966 dealer catalog covering complete line of log-periodic outdoor antennas, indoor antennas, rotators, converters, amplifiers, masting, splitter-couplers/combiners, matching transformers, lightning arrestors, antenna mounts, and hardware.*
127. *WINEGARD* — Fact-Finder #233 has specifications, and installation and service tips about the RS-230, RS-275 and RD-300 antenna amplifiers.
128. *ZENITH* — Information bulletin on antennas, rotors, batteries, tubes, power converters, record changers, picture tubes, wire, and cable.*

AUDIO & HI-FI

129. *ADMIRAL* — Folders describing line of equipment; includes black-and-white TV, color TV, radio, and stereo hi-fi.
130. *ANDREA*—Sales package about Andrea's latest line of quality B&W and Color TV receivers. Features several models designed for custom installations.
131. *ATLAS SOUND* — Catalog 566-67 illustrates and describes many new models of public address loudspeakers, microphone stands and accessories for commercial sound applications.*
132. *BENJAMIN ELECTRONIC SOUND* — Advance information on the new *Miracord* PW50H automatic record changer.
133. *JENSEN* — Multicolored 24-page catalog No. 165-L featuring speakers and headphones.
134. *OAKTRON* — "The Blueprint to Better Sound," an 8-page catalog of loudspeakers and baffles giving detailed specifications and list prices.*
135. *OXFORD TRANSDUCER* — 4-page catalog describing three lines of phonographs, tape recorders, and consoles.
136. *PERMA-POWER* — Catalog sheet about a new 25-watt solid-state megaphone.
137. *SONOTONE*—New spec sheet SAH-107 about new dynamic cardioid mikes.
138. *SWITCHCRAFT* – Bulletin 162 describes #378 *"Tini-Tee"* adapter for transistor radios which provides output for two separate earphones. Also #3843 full-fidelity personal earphone.*
139. *TANDBERG* — Colorful brochure about a line of quality tape recorders, hi-fi's and radios.
140. *TURNER MICROPHONE* — New 20-page general catalog.
141. *WATERS CONLEY* — Colorful brochure describes the full line of *Phonola* tape machines and phonographs.

COMMUNICATIONS

142. *ELECTRONIC COMMUNICATIONS* — Three new folders "Head Start," "Space Savers," and "Experience." Describing multiplex, UHF radio, and computer equipment.
143. *MOSLEY ELECTRONICS* — Folder about "Talk Power" and new stacked CB beams.*
144. *MOTOROLA* — Booklet "How You Can Profit With Motorola Two-Way Radio."*
145. *PEARCE-SIMPSON* – Specification brochure on 1BC 301 business-band two-way radio, *Companion II, Director, Escort II, Guardian 23,* and *Sentry* citizens-band transceivers. Two booklets; "Modern Business Communications" and "How to use and Choose Marine Radiotelephones."

COMPONENTS

146. *BUSSMANN*—12-page booklet listing the complete line of *Buss* and *Fusetron* small-dimension fuses by size and type. Indicates proper fuseholder — also shows list prices. Bulletin SFUS.*
147. *CORNELL-DUBILIER* — 8-page vibrator replacement guide for communication and CB equipment.*
148. *DIALIGHT* — New 8-page catalog about illuminated push-button switches.
149. *MICHIGAN MAGNETICS* — Complete catalog of recording, playback, and erase heads.
150. *QUAM-NICHOLS* — General Catalog 66 listing public address, sound systems, high fidelity, automotive, radio-TV replacement.*
151. *SARKES TARZIAN* — Catalog 66-DL-3 describes silicon and selenium replacement rectifiers.
152. *SONOTONE*—Replacement manual SAC-25 is a complete phono cartridge cross-reference guide.
153. *SPRAGUE* — Catalog C-616 is a complete 52-page guide to capacitors, resistors, filters, PC units, and capacitor testers.*
154. *TRIAD* — Form NP-23 announces 3 new color TV replacement yokes.

SERVICE AIDS

155. *CASTLE* — How to get fast overhaul service on all makes and models of television tuners is described in leaflet. Shipping instructions, labels, and tags are also included.*
156. *CLEVELAND INSTITUTE OF ELECTRONICS* – New pocket-sized, plastic "Electronics Data Guide" of formulas and tables, including frequency and wavelength, db formulas and table, antenna lengths, and color code.*
157. *COLMAN* — FB-23 illustrates uses for *Kleenall* relay and contact cleaner.
158. *ELECTRONIC CHEMICAL* — Brochure of aerosol chemicals for controls, tuners, and tape heads.*
159. *INJECTERALL ELECTRONICS*—Colorful brochure on a complete line of chemicals for electronic applications.
160. *LAFAYETTE RADIO ELECTRONICS* — 1967 Catalog, No. 670 — featuring two-way radios, stereo hi-fi, tape recorders, test equipment and components.
161. *MID-STATE TUNER* — Informative flyer and shipping labels on 24-hour service for all makes TV tuners.
162. *PRECISION TUNER* — Literature supplying information on complete low-cost repair and alignment service for any TV tuner.
163. *RAWN* — Bulletins on repair ideas using *Plas-T-Pair* knob and plastic repair kits, also tuner cleaners and circuit coolers.
164. *SPRAYWAY* — Bulletin on a new silicone spray release agent.
165. *YEATS* — The new "back-saving" appliance dolly Model 7 is featured in a four-page booklet describing featherweight aluminum construction.*

SPECIAL EQUIPMENT

166. *CLEVELAND ELECTRONICS* — 3 multi-color flyer sheets describing *Babe* reverberation kit, and *Cathedral-Sonic* self-contained reverberation kit.
167. *TRIPLETT* — Data sheet on model 820-U AC/DC measuring instrument with overhead projector for dynamic classroom display.*

TECHNICAL PUBLICATIONS

168. *HAYDEN* — New, 64-page catalog listing books published by the Hayden Book Company, Inc. and John F. Rider Publisher, Inc. for the electronics service technician, student, and hobbyist.
169. *RCA INSTITUTES, INC.* — New 1966 Career Book, "Your Career in a World of Electronics," describes programs and courses in television, telecommunications, automation and industrial electronics, drafting, and computer programming.*
170. *HOWARD W. SAMS* — Literature describing popular and informative publications on radio and TV servicing, communications, audio, hi-fi, and industrial electronics, including special new 1966 catalog of technical books on every phase of electronics.*

TEST EQUIPMENT

171. *B & K* — New 1966 catalog featuring test equipment for color TV, auto radio, and transistor radio servicing, including tube testers designed for testing latest receiving tube types.*
172. *EICO* — New 32-page full-line catalog. Describes a complete line of test instruments, CB and ham equipment, hi-fi components, and miscellaneous electronic equipment.*
173. *HICKOK* – Technical specifications on new models 860 signal tracer, CR-35 CRT tester, and GC-660 color generator.*
174. *JACKSON* — New catalog of "Service Engineered" test equipment.*
175. *MERCURY ELECTRONICS* — All-new catalog of time saving test equipment.*
176. *SECO* — Catalog sheet #200-SS on Model 260 transistor analyzer and Model 240 SCR analyzer.*
177. *SENCORE* — New 4-color catalog about *"Econoline"* test equipment.*
178. *SIMPSON* — Flyer giving specifications of Model 604 multicorder for measuring and recording volts, amps, milliamps, and microamps.
179. *TRIPLETT* — New 12-page catalog about G, M, and other series panel meters, other meters and instruments.

TOOLS

180. *ENTERPRISE DEVELOPMENT*—Time-saving techniques in brochure from *Endeco* demonstrates improved desoldering and resoldering techniques for speeding and simplifying operations on PC boards.*
181. *GREENLEE* — Catalog E-730-15 pictures the complete line of standard and special chassis punches.
182. *KRAEUTER* — Full-line catalog showing display assortments of pliers, wrenches, snips, punches, and chisels.
183. *VACO* — Catalog No. SD-119 on interchangeable-blade snap driver kits and components. Also two new booklets; "How to Use Screwdrivers," and "Helping Hand for Electrical Wiring."*

TUBES & TRANSISTORS

184. *AMERICAN ELITE* -- Technical data book for *Telefunken* tubes, semiconductors, and components, with list of comparative types.
185. *AMERICAN RECTIFIER* — 16-page handbook — "Understanding and Maintaining Industrial Rectifiers."
186. *FAIRCHILD* — Brochure describing complete line of silicon planar epitaxial linear integrated circuits.
187. *SEMITRONICS* — Suggested list price schedule of EIA semiconductors.
188. *WORKMAN* — Transistor cross-reference for use with *Miracle Five* transistor line that replaces 2,977 entertainment-type transistors.*

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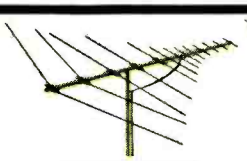
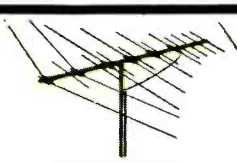
TESTED AND CERTIFIED FOR PERFECT COLOR

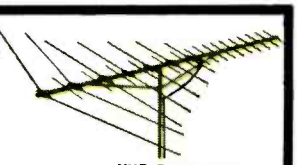
UHF CR-5
Fringe Area



UHF/VHF/FM 1113
Mid Fringe



VHF/FM 1015H
Mid Fringe



VHF/FM 1023H
Deep Fringe

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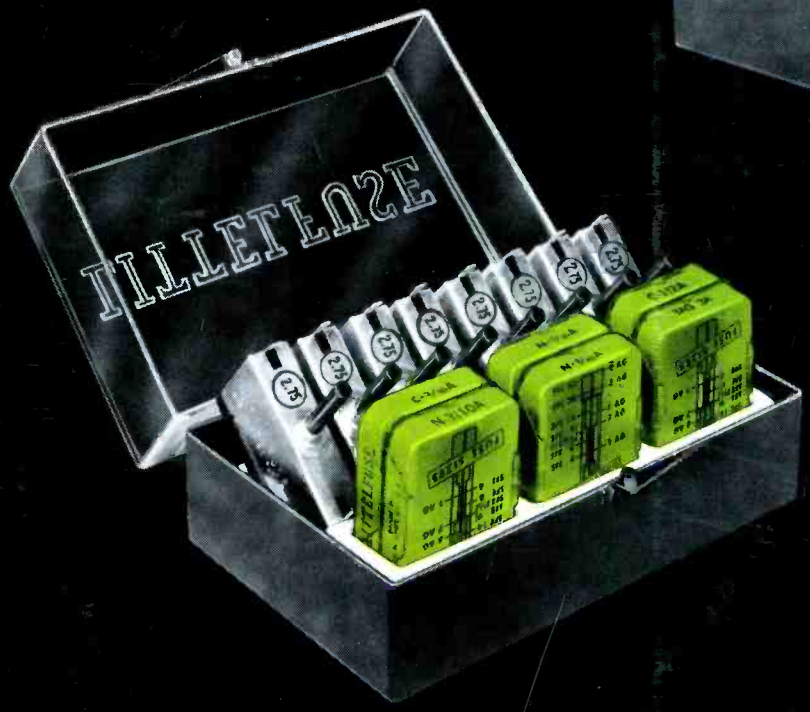

CADDY #094076

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30 Popular Fuses: 5 each — N 3/10, N 7/10, N 1, C 3/10, C 1/2, C 3-1/2.

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