


# ELECTRONIC TECHNICIAN / DEALER

WORLD'S LARGEST TV-RADIO SERVICE & SALES CIRCULATION

FEBRUARY 1969  A HARBRACE PUBLICATION

Sylvania Color Slide Theater

Selling and Installing MATV

Testlab Report on Jerrold and Leader

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7176 SALLE RD  
ATLANTA  
48411



# Color Power.

EICO gives you the most professional color power for your instrument dollar.



INTRODUCING THE VALUE LEADER IN BATTERY-OPERATED PORTABLE SOLID STATE COLOR GENERATORS — EICO 385!

### Exclusive Features

- Compact "Tote-Easy" Design • Computer-Type Circuitry • Double Sided PC Board Construction • Low Price

The versatile "go everywhere" EICO 385 solid state color generator, packaged in an exclusive compact portable/storage case, has been designed to furnish the service technician with five essential functions. The generated patterns are the standard offset carrier-type 10 color bars, precision dots, crosshatch, and an individual series of vertical and horizontal lines.

Advanced computer-type circuitry, coupled with three temperature compensated crystals, provides the drift-free stability inherent in this instrument. A multipurpose color-coded gun killer with its convenient socket-adaptor assembly, (no more fumbling) stores in the case. Clips directly to TV antenna terminals (fast & sure!). The EICO 385 is powered by six long-life "C" cells or the AC adaptor accessory. The economical package contains all you need to enable you to do a fast yet reliable job.

Easy-to-assemble Kit: **\$79.95**  
Wired: **\$109.95**



## EICO's complete Color TV Lab for the pro

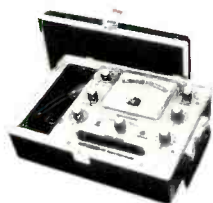
Praised by the pros for laboratory precision at lowest cost



**Model 369 Sweep/Marker Generator.** For easiest, fastest Visual alignment of color or b/w TV and FM RF and IF circuits. Five sweep ranges from 3-220 MHz. Four marker ranges from 2-225 MHz. Crystal marker oscillator. Post injection of markers. **\$99.95 Kit, \$149.95 wired.**

**Model 435 Direct-Coupled Wideband Scope.** Top-quality DC-4.5 MHz scope with 3" flat-face. CRT Zener calibrator. Outperforms 5" scopes, facilitates on-location color TV and other servicing. **\$119.95 Kit, \$169.95 wired.**

**New Model 235 Professional VTVM.** Designed especially for solid-state servicing. Accurate to as little as 0.01 volts on its 1/2-volt scale. RMS/p-p/DS/ohms in 7 overlapping ranges. Big six-inch meter, 200 ua movement. **\$49.95 Kit, \$69.95 wired.**



**NEW EICO 633** Portable All-Solid-State CRT Tester and Rejuvenator. Rapidly tests and rejuvenates color as well as black and white picture tubes. Line adjustment control, 12 different filament voltages, individual voltages applied to two of the grids, accurate meter — all insure precise measurements. Continuity and leakage checked through transistorized VOM, read directly on meter. **\$69.95 Kit, \$99.95 wired.**



**NEW EICO 635** Deluxe All-Purpose Portable Tube Tester. Thoroughly professional, full-range modern versatility. Tests all standard tubes and even the new decals, magnovals, 7-pin nuvistors, and popular TV picture tubes. "Take-it-anywhere" design expressed in a modern, rugged, scuff-proof, luggage case. Compact (4"H, 12 1/2"W, 9"D) and lightweight, 4 1/2 lbs. Quick, accurate, dependable and the price is modest. **\$44.95 Kit, \$69.95 wired.**



**NEW EICO PSI-1** Solid-State Signal Injector Probe. Perfect for on-the-spot signal tracing in the field. Pen-size, self-powered, self-contained signal generator from 1,000 Hz with harmonics to 30 MHz. Ideal for trouble-shooting audio, IF & RF circuitry in any electronic equipment, transistorized or vacuum tube. Use it once — you'll never want to be without it! **\$5.95 Kit, \$9.95 wired.**



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COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS  
AND TECHNICAL INFORMATION FOR 6 NEW SETS

GROUP  
**198**

SCHEMATIC NO.

SCHEMATIC NO.

ADMIRAL ..... 1205  
TV Chassis T3K4-1A, T3K4-1B

PHILCO-FORD ..... 1207  
Color TV Chassis 19KT50/50B

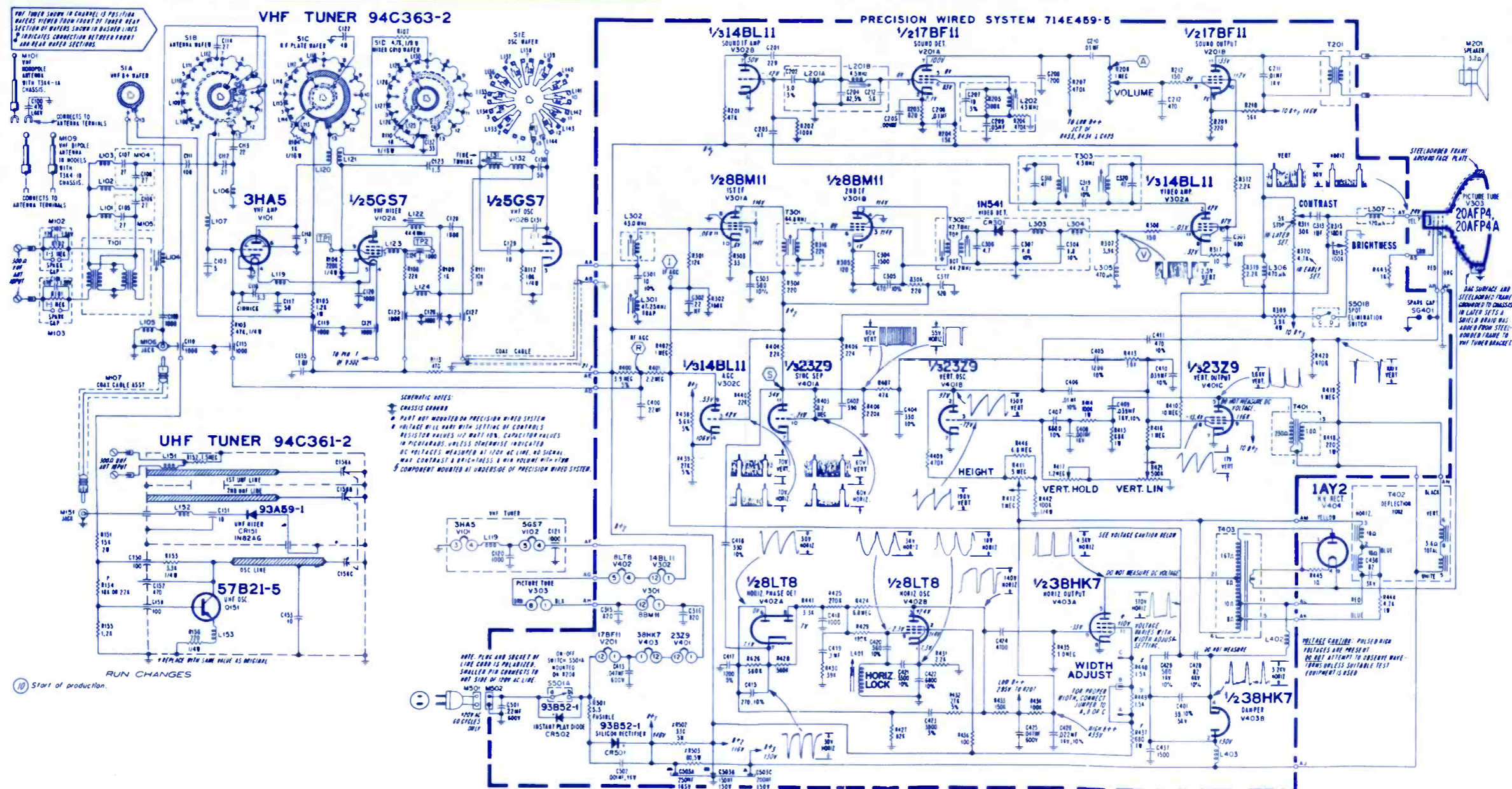
AIRLINE ..... 1208  
TV Model GEN-11269A

SYLVANIA ..... 1209  
TV Chassis B10-1,2

MAGNAVOX ..... 1206  
Color TV Chassis T938

TRUETONE ..... 1210  
TV Model 2DC3918, 19

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# 1206

## MAGNAVOX

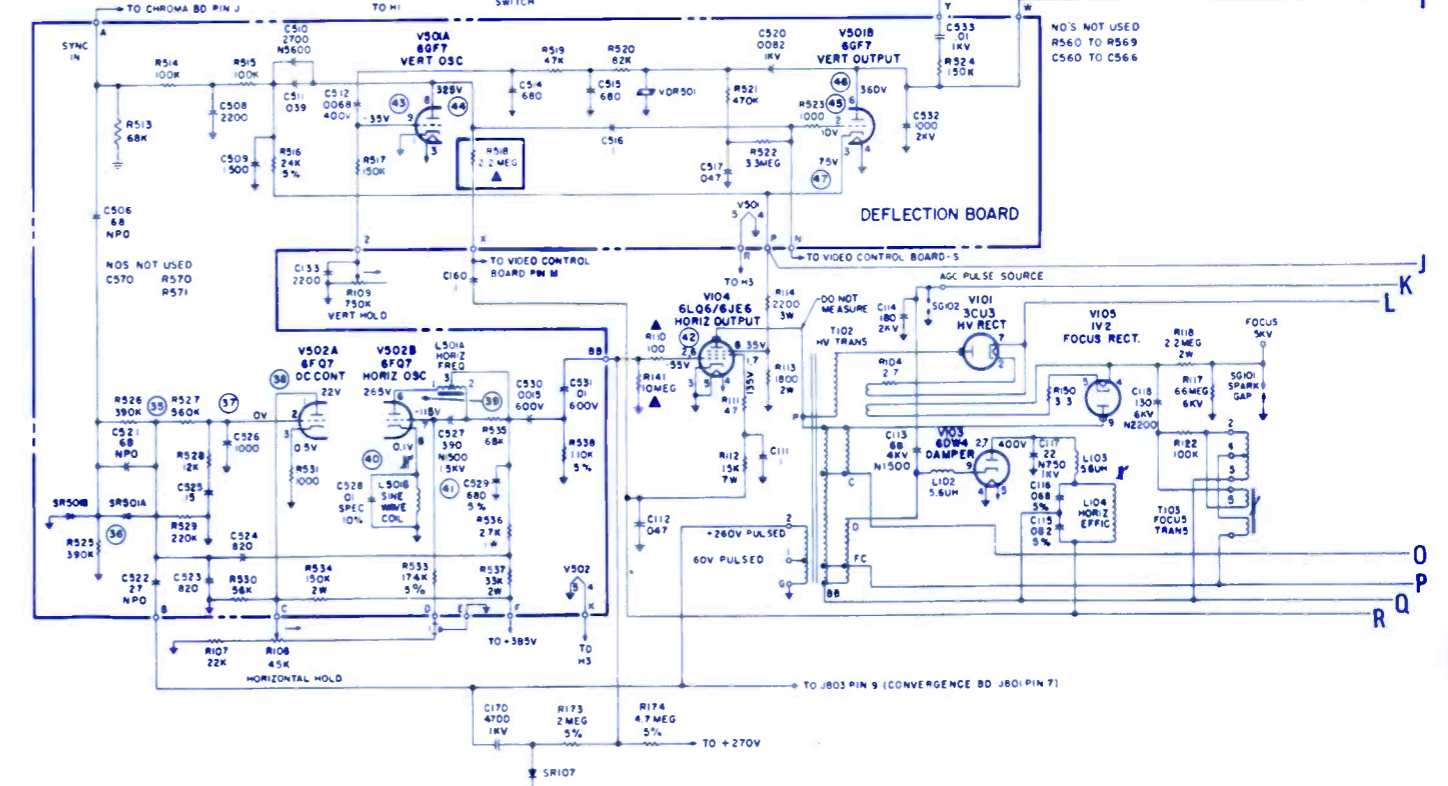
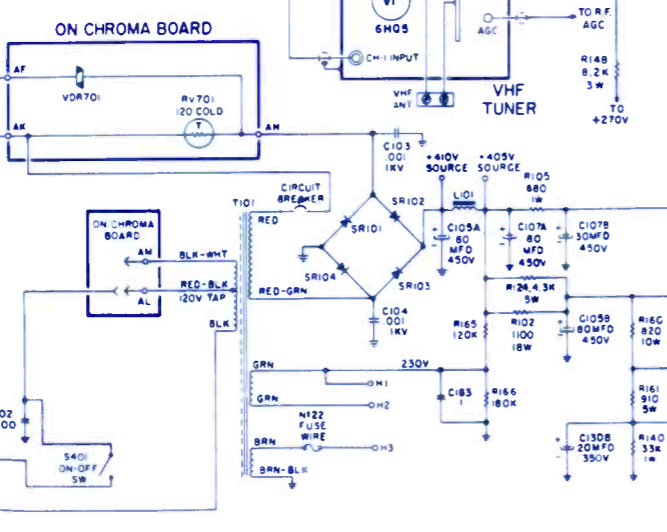
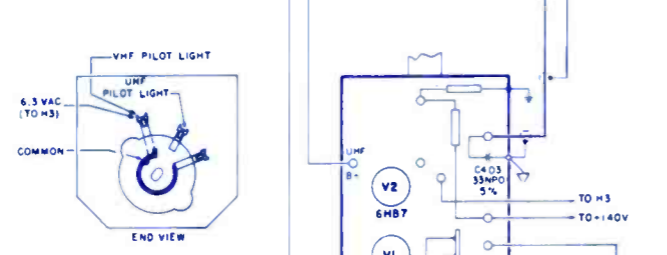
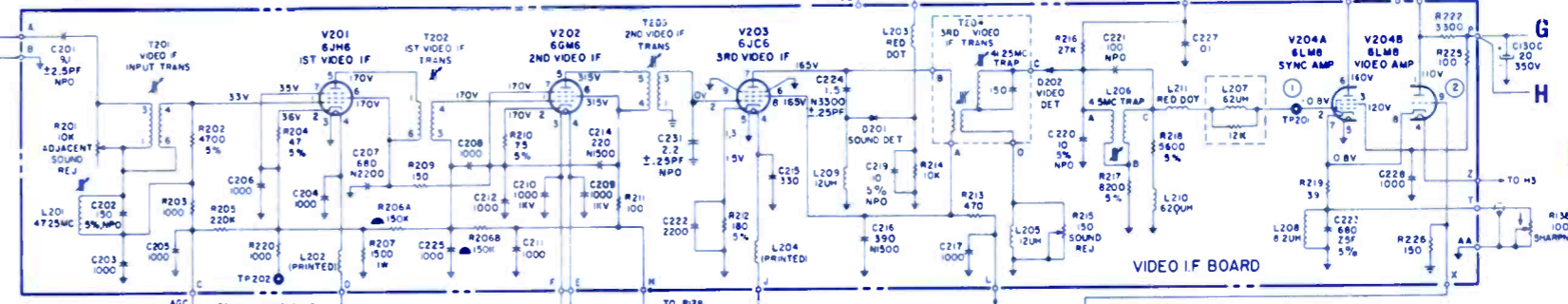
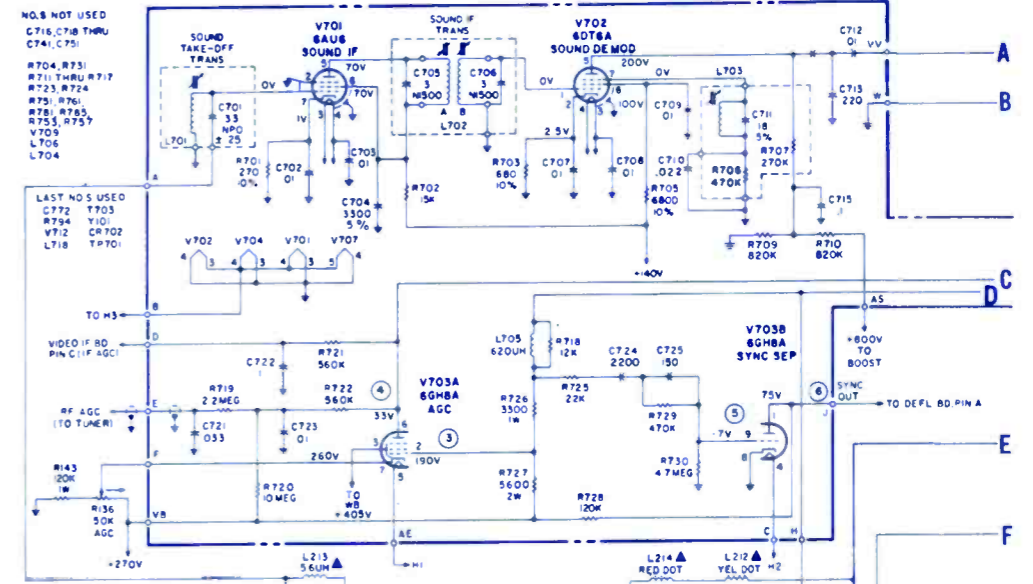
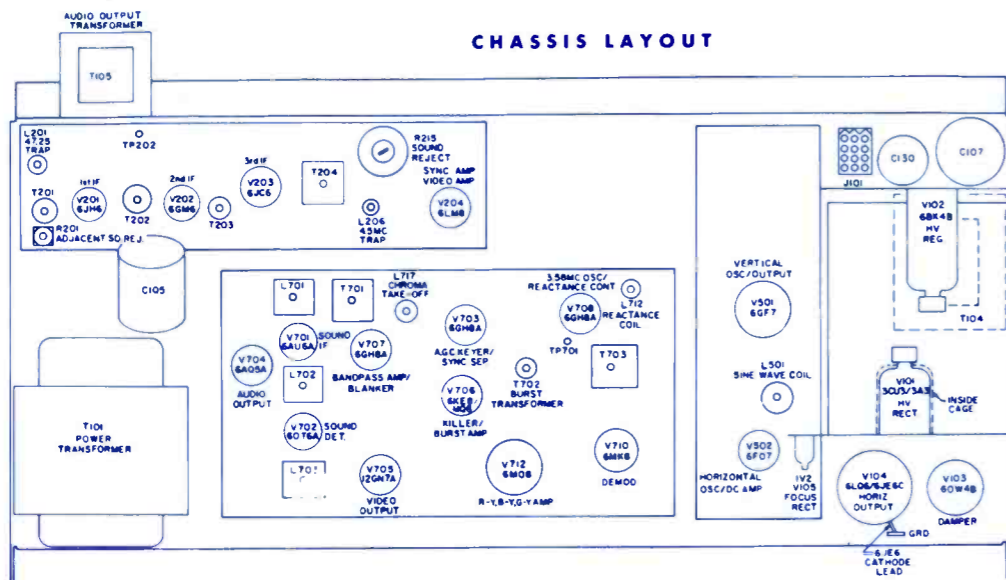
Color TV Chassis  
T938

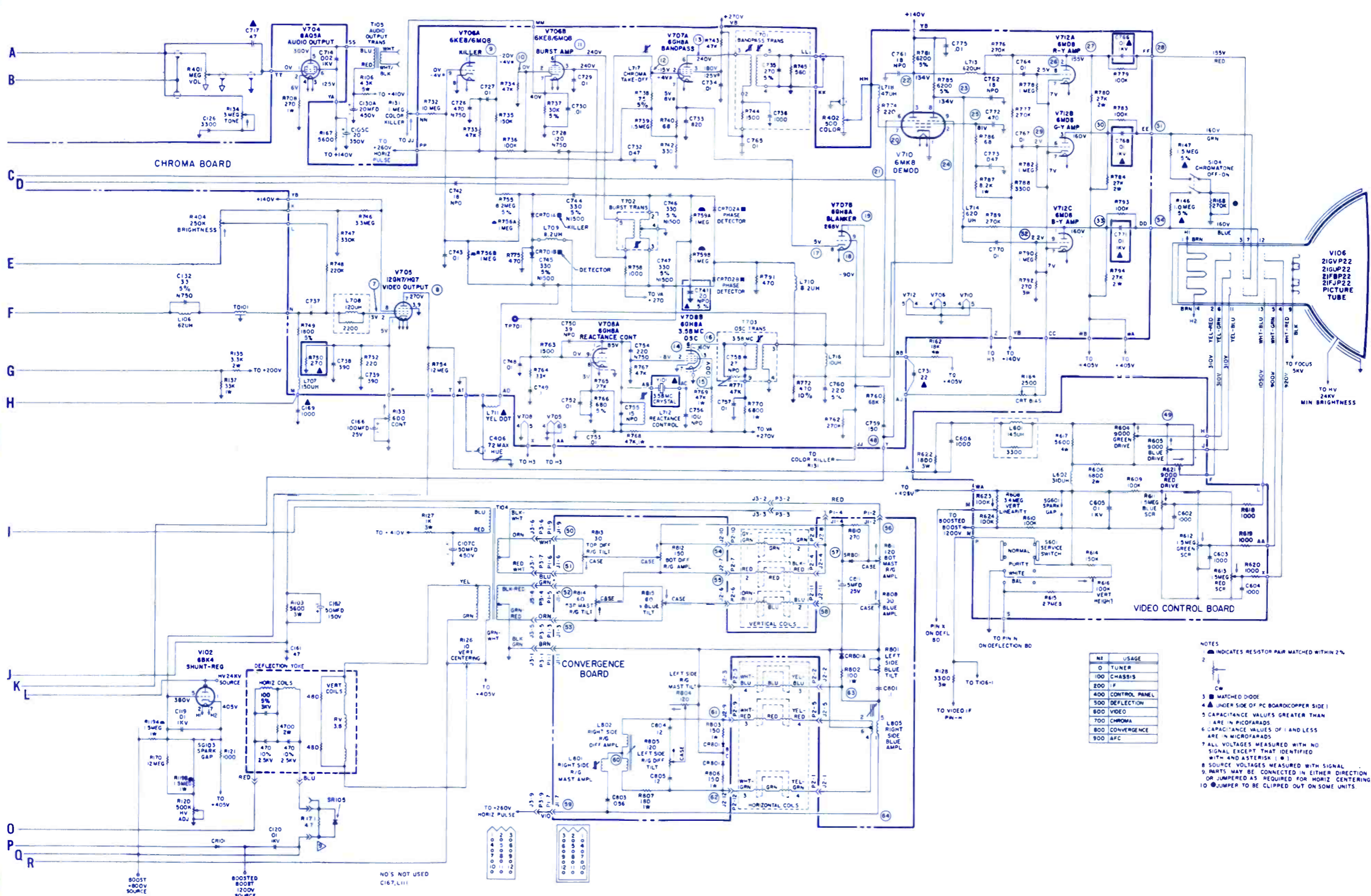
### ELECTRONIC TECHNICIAN/DEALER **TEKFA**X

COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS  
AND TECHNICAL INFORMATION FOR 6 NEW SETS

FEBRUARY • 1969

#### CHASSIS LAYOUT



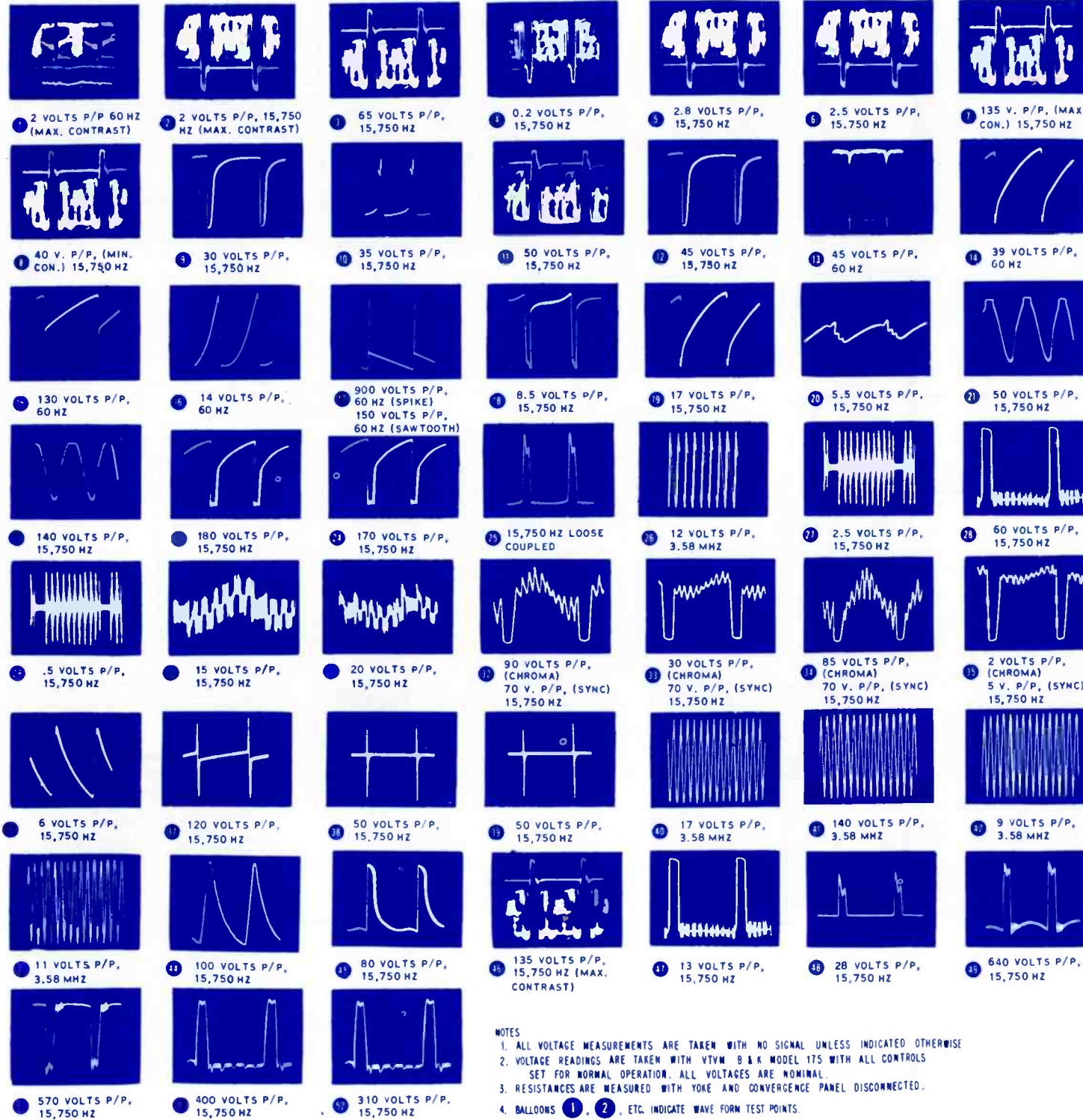


NR	USAGE
0	TUNER
100	CHASSIS
200	IF
400	CONTROL PANEL
500	DEFLECTION
600	VIDEO
700	CHROMA
800	CONVERGENCE
900	AFC

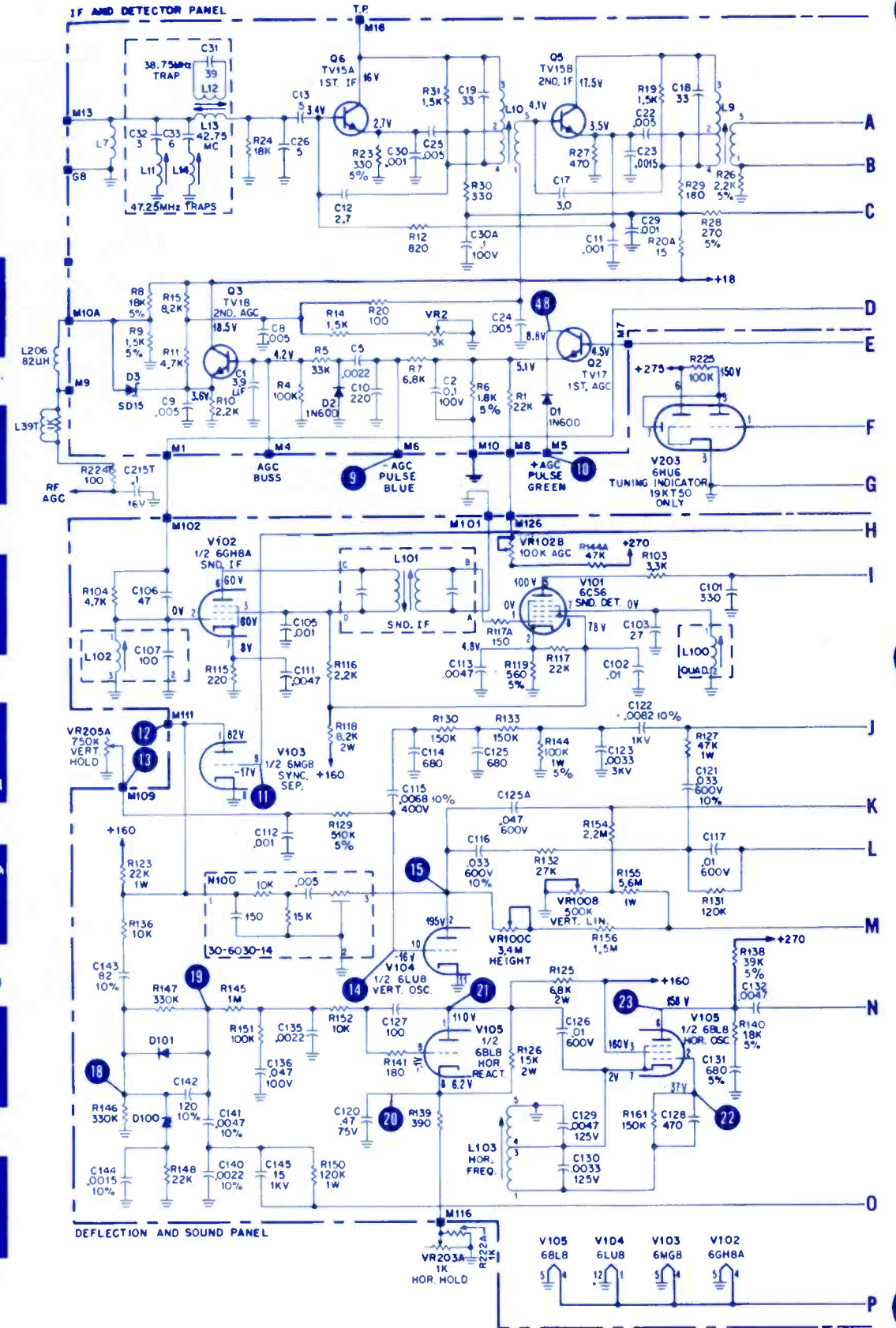
- NOTES
- INDICATES RESISTOR PAIR MATCHED WITHIN 2%
  - UNDER SIDE OF PC BOARD (COPPER SIDE)
    - CAPACITANCE VALUES GREATER THAN 1 ARE IN PICOFARADS
    - CAPACITANCE VALUES OF 1 AND LESS ARE IN MICROFARADS
  - ALL VOLTAGES MEASURED WITH NO SIGNAL EXCEPT THAT IDENTIFIED WITH AN ASTERISK (\*)
  - SOURCE VOLTAGES MEASURED WITH SIGNAL
  - PARTS MAY BE CONNECTED IN EITHER DIRECTION OR JUMPERED AS REQUIRED FOR HORIZ CENTERING
  - JUMPER TO BE CLIPPED OUT ON SOME UNITS

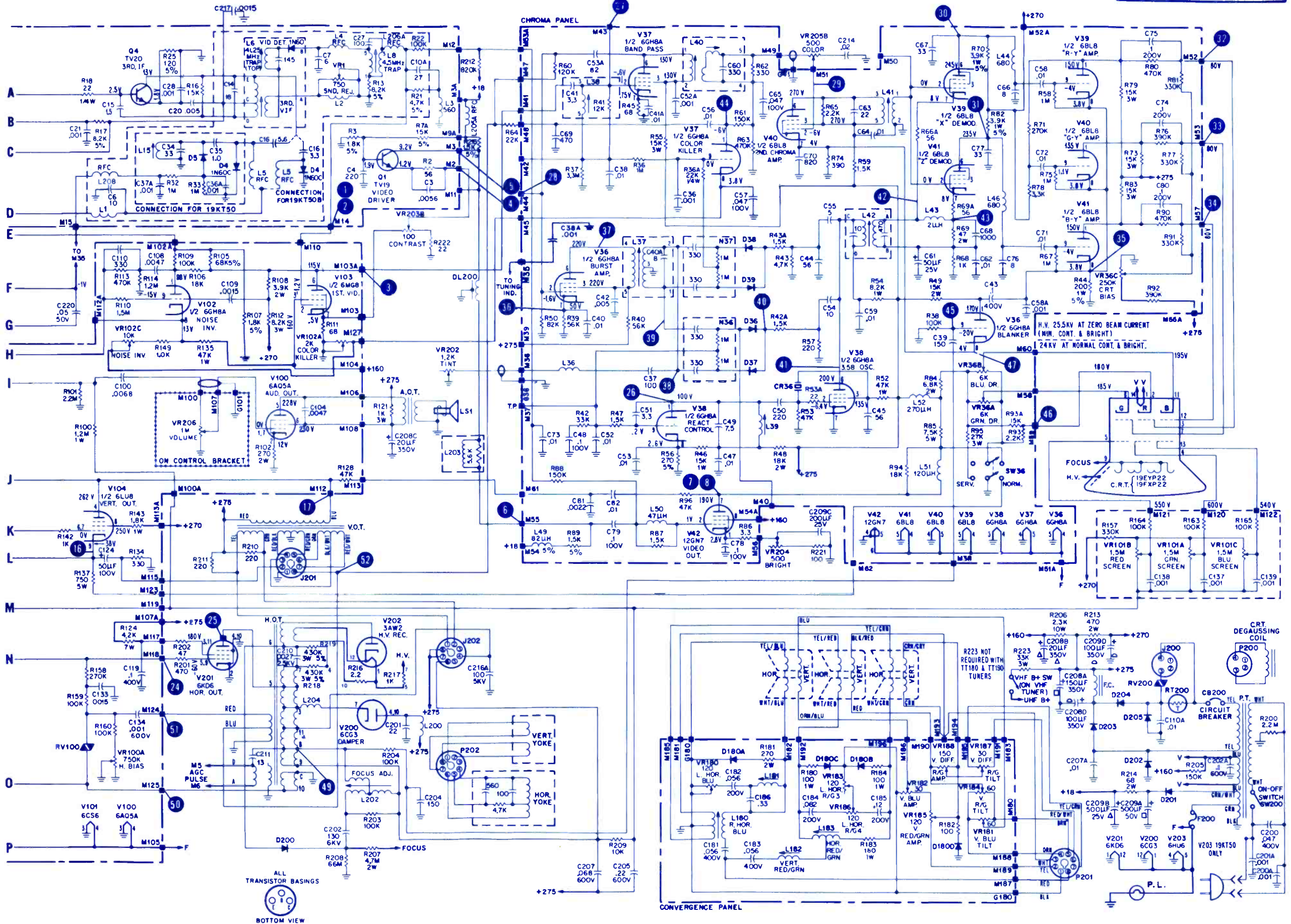
OSCILLOSCOPE WAVEFORM PATTERNS 19KT50/B CHASSIS

These waveforms were taken with the receiver AGC control adjusted for an approximate peak-to-peak output of two volts at the video detector, using an air signal. Do not reset AGC control when using color bar generator. All monochrome voltages taken with average air signal and all chroma voltages taken with a color bar generator connected to the antenna input terminals. The chroma peak-to-peak voltages were taken with the chroma control set for 0.5V peak-to-peak at Pin 2 of V40 and the tint control set for proper color bars (approximately mid-range), all other controls set for normal viewing. The frequencies shown are those of the waveforms.....not the sweep rate of the oscilloscope. All voltages taken with a wide band scope having a 5MHz bandwidth similar to B & K Model 1450.



NOTES  
 1. ALL VOLTAGE MEASUREMENTS ARE TAKEN WITH NO SIGNAL UNLESS INDICATED OTHERWISE  
 2. VOLTAGE READINGS ARE TAKEN WITH VTVM B & K MODEL 115 WITH ALL CONTROLS SET FOR NORMAL OPERATION. ALL VOLTAGES ARE NOMINAL.  
 3. RESISTANCES ARE MEASURED WITH YOKE AND CONVERGENCE PANEL DISCONNECTED.  
 4. BALLOONS 1, 2, ETC. INDICATE WAVE FORM TEST POINTS.



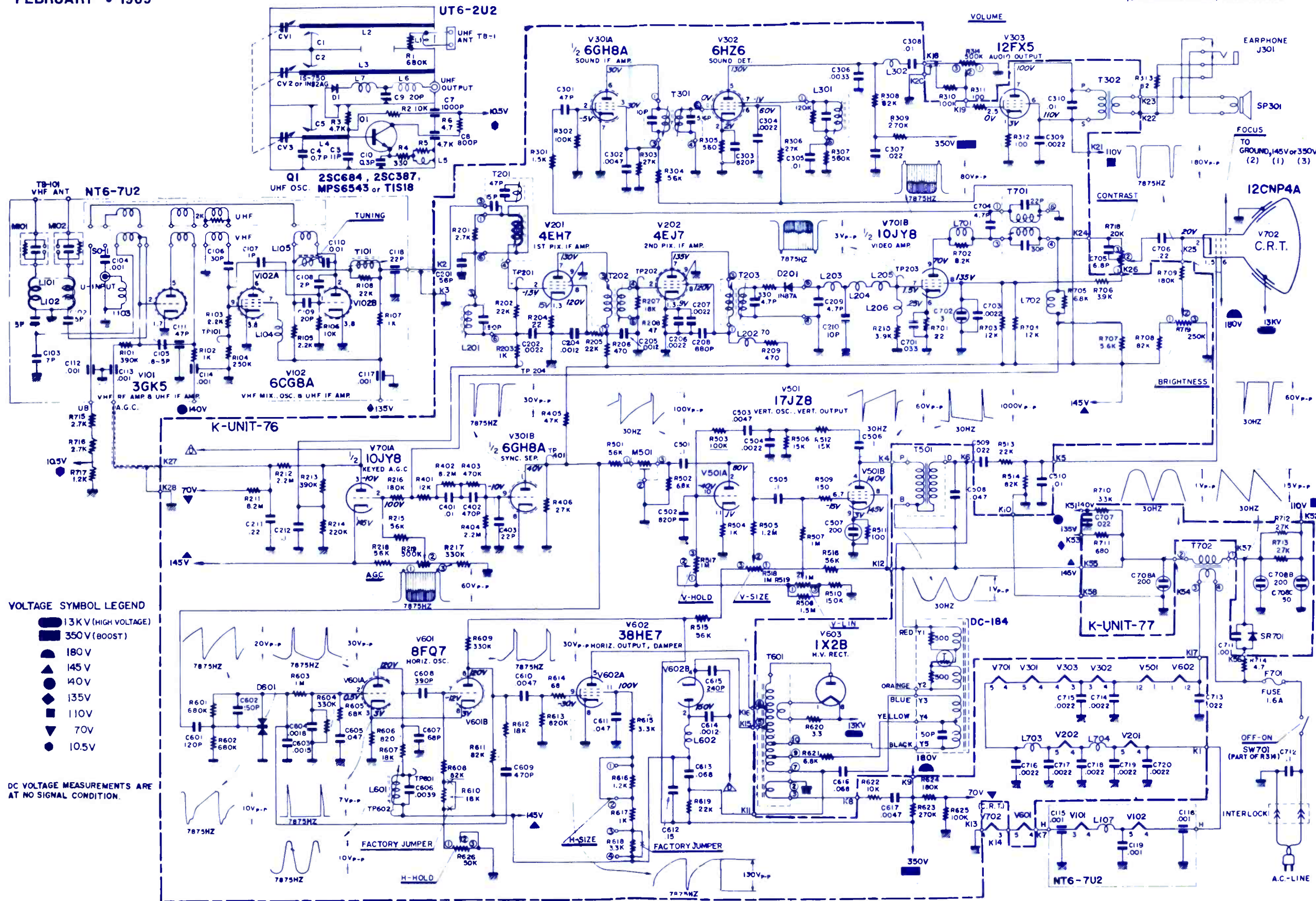


COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS  
AND TECHNICAL INFORMATION FOR 6 NEW SETS

SYMBOL	DESCRIPTION	AIRLINE PART NO.
C708A, B, C	200µ1/200µ1/50µ1 @180velect	TV32164
R219	500K pot AGC (9V120)	TV25234
R314	SW701 - 500K pot on-off vol w/switch (8V020 UL)	TV2574
R517	1 M pot vert hold (9V117)	TV25237
R518	1 M pot vert lin (9V119)	TV25238

R519	1 M pot vert size (9V119)	TV25238
R626	50K pot horiz hold (9V121)	TV25240
R718	20K pot contrast (8V007)	TV25272
R719	250K pot bright (9V118)	TV25239
L201	coil 47.25MHz trap (2TIF487)	TV62248
L301	coil sound detector (TIF544)	TV62254
L601	coil horiz hold (TL23)	TV61174
T201	x-former 1st pix IF & 50.25 MHz trap (TIF 367)	TV62339

T202	x-former 2nd pix IF (TIF379)	TV62340
T203	x-former pix detector (TL99)	TV62290
T301	x-former sound IF (TIF378)	TV62341
T302	x-former audio output (7T179)	TV11215
T501	x-former vert output (8T192)	TV11216
T601	x-former horiz output (8FT640)	TV11224
T701	x-former sound IF & 4.5 MHz trap (2TIF491)	TV62252
T702	x-former power choke (9T204)	TV11218
M501	capristor (PRC302)	TV3455
	yoke deflection assembly	TV61447





SYMBOL	DESCRIPTION	PART NO.
C324	-.001µf 1.6kv	45-88215-17
C432	-20pf 5kv	43-11028-4
C434	-82pf 3kv N1500	43-95914-1
C500	-3 section elect	41-27821-1
C500A	-150-350v	41-27821-1
C500B	-100-350v	41-27821-1
C500C	-5-350v	41-27821-1
R118	-1M volume On/Off	37-15287-3
R224	-220K AGC	37-11632-1
R248	-7K-7w (-2 var)	35-92495-16
R250	-25K contrast	37-27837-1

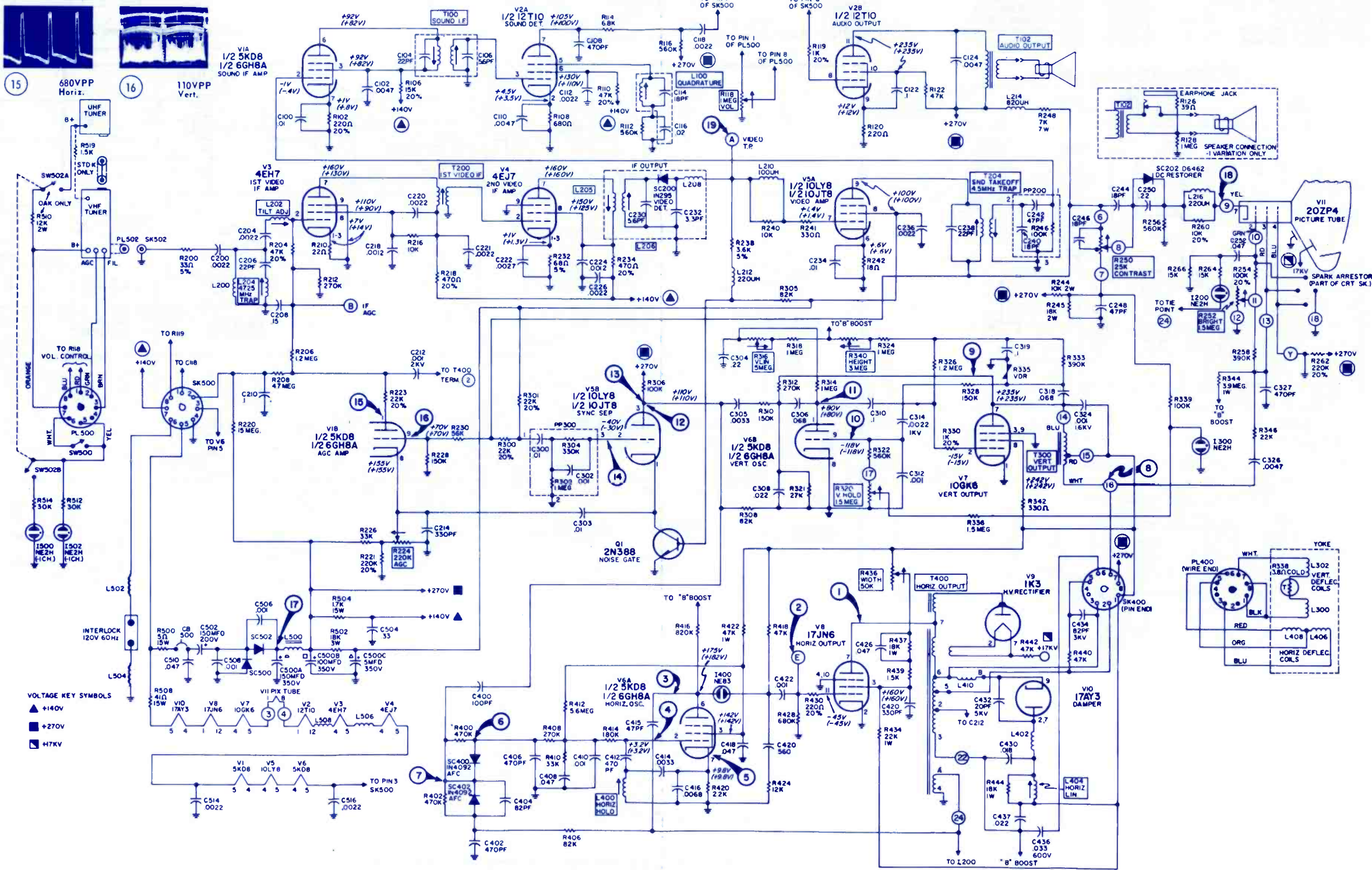
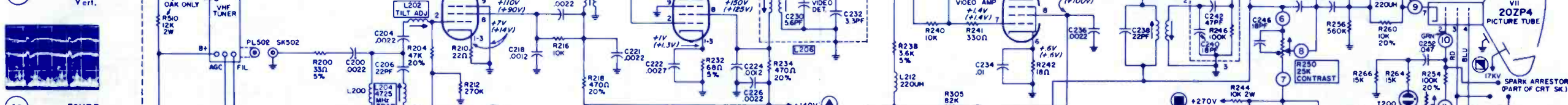
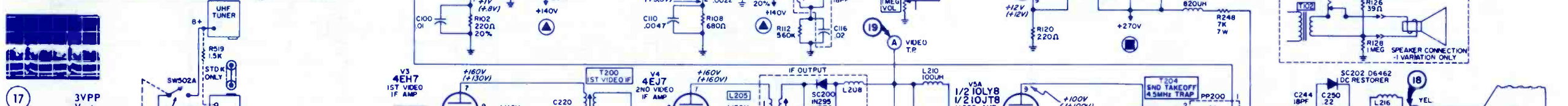
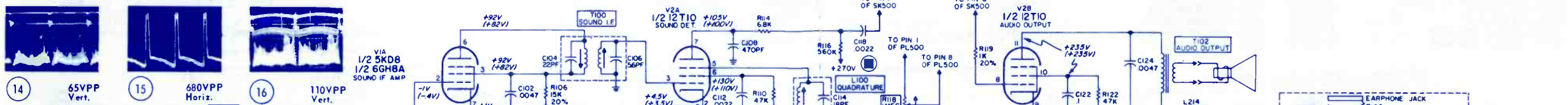
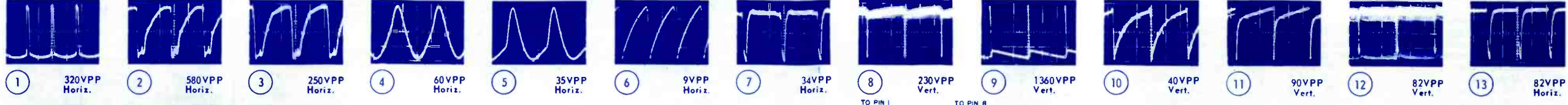
R252	-1.5M bright	37-27837-2
R316	-5M vert lin	37-11632-1
R320	-1.5M vert hold	37-27837-2
R335	-VDR	38-15275-17
R340	-3M height	37-11632-1
R436	-50K width	37-27868-1
R500	-5015w	36-92898-18
R502	-18K 3w	35-92495-41
R504	-1.7K 15w	36-92898-19
R508	-41K 15w	36-92898-48
L100	-quad	57-11602-1
L202	-tilt adj	57-11611-1
L204	-47.25MHz trap	57-11637-1
L206	-video detector	57-11652-1

L208	-filter	50-11634-1
L212	-220µh peaking	50-15318-12
L214	-820µh peaking	50-15318-19
L400	-horiz hold	50-27910-1
L402	-filter	50-92043-3
L404	-horiz lin	50-15019-1
L500	-choke filter	56-11651-6
L504	-choke	50-27390-1
L508	-choke	50-85963-2
T100	-sound xformer	57-11606-1
T102	-audio output xformer	56-27824-1
T200	-1st video IF xformer	57-11612-2
T204	-sound take off 4.58 MHz trap	57-11604-1
T300	-vert output xformer	56-27823-1

ELECTRONIC TECHNICIAN / DEALER **TEKFAK**

COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 6 NEW SETS

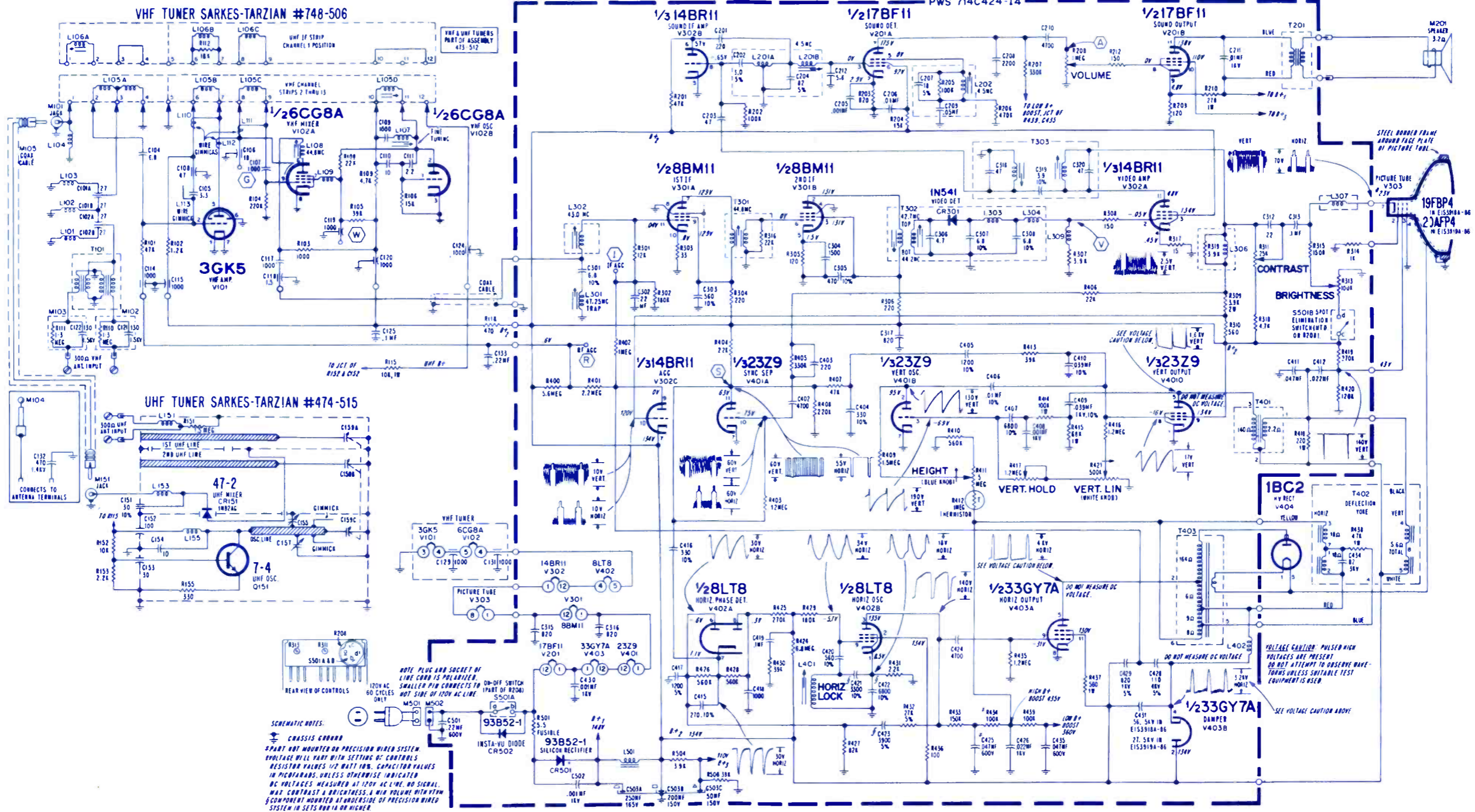
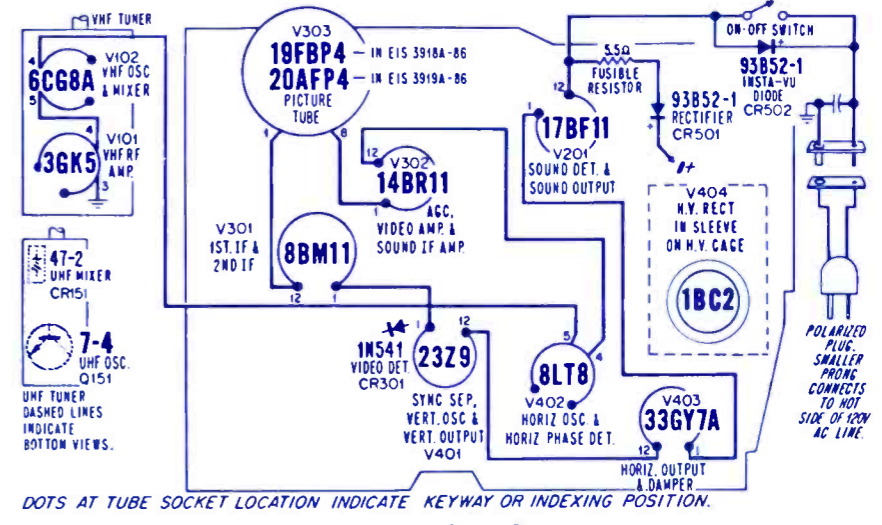
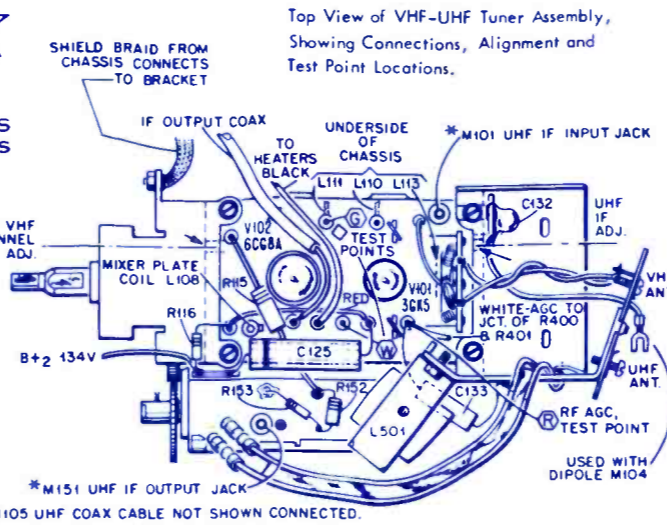
T400	-horiz output xformer	50-27819-1
SC20	-diode video detector	1N295
SC202	-dc restorer diode	06462
Q1	-trans noise gate 2N388	13-27050-1
CB500	-circuit breaker tuner VHF yoke deflection	29-68908-5
		54-27848-1
		51-27822-1



FEBRUARY • 1969

SYMBOL	DESCRIPTION	TRUETONE PART NO.
R208	1M volume control & on/off switch S501 also inc. R311 & R313	75C126-2
R311	25K contrast control	Part of R208
R313	100K bright control	Part of R208
R411	5M height control	75C101-16
R412	1M thermistor	61C41-2
R417	1.2M vert hold control	75C100-8
R421	500K vert lin control	75C101-17
R432	27K 1/2 w 5%	60B7-273
R501	5.5Ω fusible	61B48-1
C503A	250μf 165v elect	67D30-12
C503B	200μf 150v elect	67D30-12

C503C	50μf 150v elect	67D30-12
L201 A&B	sound IF & phase shift coil (inc C212)	72C301-4
L202	quad coil (inc C207 & R205)	72C132-82
L301	47.25MHz trap	72C308-1
L302	IF input coil	72C308-1
L303	5.6mH RF coil	73B53-243
L304	RF choke	73C31-3
L401	horiz lock coil	94D17-19
L501	filter choke	74D18-60
T201	audio output xfmr	79D124-1
T301	1st IF xfmr	72C308-2
T302	2nd IF xfmr	72C310-1
T303	3rd IF & sound trap	72C185-7
T401	vert output xfmr	79C123-1
T402	deflection yoke assm	700D814-5
T403	horiz output	79D117-5



REAR VIEW OF CONTROLS

NOTE: PLUG AND SOCKET OF LINE CORD IS POLARIZED. SMALLER PIN CONNECTS TO HOT SIDE OF 120V AC LINE.

SCHEMATIC NOTES:

- CHASSIS GROUND
- PART NOT MOUNTED ON PRECISION WIRED SYSTEM
- VOLTAGE WILL VARY WITH SETTING OF CONTROLS
- RESISTOR VALUES 1/2 WATT 10M. CAPACITOR VALUES IN PICOGRAMS UNLESS OTHERWISE INDICATED
- DC VOLTAGES MEASURED AT 120V AC LINE. NO SIGNAL. H.V. CONTRAST & BRIGHTNESS & HIGH VOLUME WITH 100MΩ COMPONENT MOUNTED ON UNDERSIDE OF PRECISION WIRED SYSTEM IN SETS WITH OR HIGHER.



# \$975

EFFECTIVE 8/1/67

## GUARANTEED

*Nine-seventy-five* buys you a complete tuner overhaul—including parts (except tubes or transistors)—and absolutely no hidden charges. All makes, color or black and white. UV combos only \$15.

*Guaranteed* means a full 12-month warranty against defective workmanship and parts failure due to normal usage. That's 9 months to a year better than others. And it's backed up by the only tuner repair service authorized and supervised by the world's largest tuner manufacturer—Sarkes Tarzian, Inc.

Four conveniently located service centers assure speedy in-and-out service. All tuners thoroughly cleaned, inside and out . . . needed repairs made . . . all channels aligned to factory specs, then rushed back to you. They look—and perform—like new.

*"Prefer a replacement? Sarkes Tarzian universal replacements are only \$10.45, customized replacements \$18.25. Universal replacements shipped same day order received. On customized, we must have original tuners for comparison purposes, also TV make, chassis, and model number. Send orders for universal and customized replacements to Indianapolis."*

Part #	Intermediate Frequency	AF Amp Tube	Osc. Mixer Tube	Heater
MFT-1	41.25 mc Sound 45.75 mc Video	6GK5	6LJ8	Parallel 6.3V
MFT-2	41.25 mc Sound 45.75 mc Video	3GK5	5LJ8	Series 450 MA
MFT-3	41.25 mc Sound 45.75 mc Video	2GK5	5CG8	Series 600 MA

*Genuine Sarkes Tarzian universal replacement tuners with Memory Fine Tuning—UHF Plug in for 82-channel sets—Pre-set fine tuning—13-position detent—HI gain—Lo noise—Universal mounting*

**FOR FASTEST SERVICE, SEND FAULTY TUNER WITH TV MAKE, CHASSIS, AND MODEL NUMBER, TO TUNER SERVICE CENTER NEAREST YOU**



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Zenith's uncompromising quality standards—which include tube testing at elevated line voltages for long periods—assure your customers of tubes with greater dependability and longer life.

*Be sure.* Order genuine Zenith picture tubes—for color or B&W TV—from your Zenith Distributor.

**EXCITING SURPRISES FOR YOU—and Your Family! Fun for all!**  
Get the details at your Zenith *Distributor's Parts Department.*

Why not sell the best

# ZENITH

*The quality goes in before the name goes on*

Zenith B&W replacement picture tubes are made only from new parts and materials except for the glass envelope which, prior to reuse, is inspected and tested to the same high standard as a new envelope. Zenith color picture tubes may contain used material which, prior to reuse, is carefully inspected, to meet Zenith's high quality standards.

# ELECTRONIC TECHNICIAN / DEALER

WORLDS LARGEST ELECTRONIC TRADE CIRCULATION

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## COVER

The valued use and application of test instruments in the service shop becomes increasingly more important as specialized equipments in consumer electronics and communication invade the realities of today's technology.

## TEKFAQ • 16 PAGES OF THE LATEST SCHEMATICS • Group 196

AIRLINE: TV Model GEN-13469A

GENERAL ELECTRIC: TV Chassis P-1

MOTOROLA: TV Chassis TS11 Series

PHILCO-FORD: Color TV Chassis 19QT85R

RCA VICTOR: TV Chassis KCS171 Series

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Eliminates noise due to dust, dirt and corrosion on all electrical contacts. No need to dismantle chassis—SPRA-KLEEN penetrates those hard-to-reach places quickly and efficiently—cleans and lubricates in one operation, saves time and effort.

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## ET/D EDITOR'S MEMO

### Watts a Volt?

It's happened! The International Committee of Weights and Measures met in France last October and approved a new temperature scale which goes much lower than it previously did. Other changes made by the committee were in the reference base of the volt and in the values of gravity (the gyro-magnetic ratio of the proton and the acceleration due to gravity at Potsdam).

In addition to these changes, major decisions were made with regard to international cooperation in radio frequency measurements, accurate time dissemination and standard reference materials.

The National Bureau of Standards hopes to be able to calibrate thermometers on the new scale after it is published in April 1969.

The International Bureau of Weights and Measures was authorized to decrease our good old volt by 11 parts per million. They say that this will bring the "practical" volt closer to the theoretically defined volt which is calculated from basic mechanical units of length, mass and time. The change became effective on Jan. 1 of this year and national laboratories all over the world will be busy making changes so everyone ends up in agreement with the International Bureau.

The change in the U.S. legal volt, as fixed by a group of "standard" cells at NBS (the National Bureau of Standards), will be 8.4 parts per million rather than 11 because the NBS volt and the BIPM volt have drifted apart by 2.6 parts per million since the last adjustment.

So our old volt is changing and it looks like further activity is planned for comparisons of measurements of radio frequency quantities such as power and attenuation.



*Paul J. ...*

# At last! A practical way to provide servicing training right in your own shop.

ICS offers the lowest priced course in TV Repair and Servicing on the market today—less than \$100. Yet you'll say that the texts on color repair alone are worth double the price.

No other training course available today can touch the new ICS TV Servicing/Repair Course for practicality and simplicity.

It solves your training problems. Saves valuable shop time... expands employee capacity and professionalism. Fact is, with the very first text, a complete novice can learn to repair 20 percent of all TV troubles. In just a few short months, he can be doing advanced bench test and repair work, on color sets as well as black-and-white. Practice work on trade-ins or sets you're repairing.

6 texts, 936 pages in all. 329 illustrations. Photos show how to recognize and diagnose the effect of various TV troubles on the screen. Concise, easy-to-follow texts tell how to remedy the trouble and why that remedy is best. Self-examinations along the way measure what is learned.

Fully approved by the National Electronic Associations for use in their apprenticeship program; the first course to receive this recognition. Completion of final exam an important step toward NEA certification.

Plus, at no extra charge—complete, easy-to-understand glossary of TV terms (schematics of top models of leading TV manufacturers also available—a bargain in itself). For full information, fill out coupon and mail today.

**ICS**

ICS, Dept. K8518B, Scranton, Penna. 18515

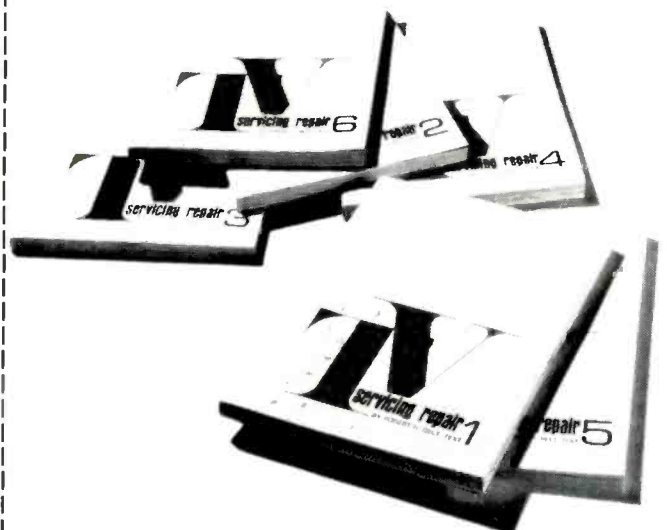
Yes, I'm interested in your new TV Servicing/Repair Course for training in my shop. Please send me complete information without obligation.

Name \_\_\_\_\_

Street \_\_\_\_\_

City \_\_\_\_\_

State \_\_\_\_\_ Zip \_\_\_\_\_



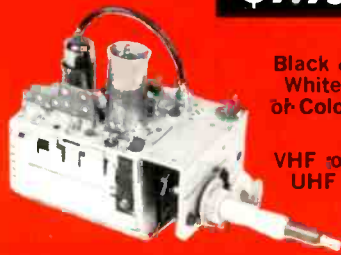
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Maximum Time In Shop 24 Hrs.

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or Color

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UV Combo's \$16.50

Price includes all labor and parts except Tubes, Diodes & Transistors. If combo tuner needs only one unit repaired, disassemble and ship only defective unit. Otherwise there will be a charge for a combo tuner.

Ship tuners to us complete with Tubes, Tube Shields, Tuner Cover and all parts (including) any broken parts. State chassis, model number and complaint.



All tuners are serviced by FACTORY TRAINED TECHNICIANS with years of experience in this specialized field. All tuners are ALIGNED TO MANUFACTURERS SPECIFICATION on crystal controlled equipment and air checked on monitor before shipping to assure that tuner is operating properly.

## GEM CITY TUNER REPAIR SERVICE

Box 6D Dabel Station  
2631 Mardon Drive  
Dayton, Ohio 45420

## ET/D LETTERS TO THE EDITOR

### Japanese Junk

While there may be some merit in your finger-shaking editorial of October 1968, the Yankee ingenuity and know-how that has brought us Hi Fi from Hong Kong, transistorized tape from Taiwan and junk from Japan may also make "lion tamers in Northern Siberia" big money.

One thing that many of us have learned from our servicing experience is that change and innovations don't necessarily represent technological advances—in other words, a cheaper mousetrap isn't necessarily a better one! The technicians, like the doctors you mentioned, are specializing and staying on top of those advances that pay off. We'll go along with anything the engineers and sales people want to design and sell—if we can make a living wage at it and are not singled out as the ultimate goats by manufacturer and consumer alike for not being able to make their space age bargains perform as claimed by the seller and as expected by the buyer.

Servicing procedure and techniques come from experience. And if properly applied, they will help any technician to efficiently locate and replace defective parts in any electronic equipment. Unfortunately, the same cannot always be said about design procedures and techniques!

If and when the level of our rapidly advancing industry gets 100 percent with the "\$6.75 super, solid state, space age, giant 2½ in. speaker concept," you may live to see "lion tamers in Northern Siberia."

H. NEUMAN

Waldport, Ore.

### Prime Tool

Please accept this letter as an expression of sincere appreciation and gratitude for printing my letter requesting a Harmon-Kardon CPR-2 preamplifier. It resulted in my locating one of these units from a supplier in Los Angeles.

I have been trying every possible source for this unit with no results, and until my letter appeared in your magazine, the results were nil. ELECTRONIC TECHNICIAN/DEALER has always been one of my primary tools and it shall continue to be.

KEITH CROCKETT

St. Joseph, Mo.

*Our thanks to H. Neuman, Keith Crockett and others for their comments and letters...Ed.*

## NEW

# "Tray biens" most versatile of all nutdriver sets

Handy "Tray Bien" sets lie flat or sit up on a bench, hang securely on a wall, pack neatly in a tool caddy.

Lightweight, durable, molded plastic trays feature fold-away stands, wall mounting holes, and a snap lock arrangement that holds tools firmly, yet permits easy removal.

Professional quality Xcelite nutdrivers have color coded, shockproof, breakproof, plastic (UL) handles; precision fit, case-hardened sockets.

Hangs up



Stands up



Holds tools  
securely



No. 127TB "Tray Bien" set — 7 solid shaft nutdrivers (3/16" thru 3/8" hex openings)

No. 137TB "Tray Bien" set — 5 solid shaft nutdrivers (3/16" thru 3/8" hex openings) and 2 hollow shaft nutdrivers (1/2" and 9/16" hex openings)

No. 147TB "Tray Bien" set — 7 hollow shaft nutdrivers (1/4" thru 1/2" hex openings)

WRITE FOR BULLETIN N666

# XCELITE

XCELITE, INC., 14 Bank St., Orchard Park, N. Y. 14127  
In Canada contact Charles W. Pointon, Ltd.

... for more details circle 148 on postcard

ELECTRONIC TECHNICIAN/DEALER

... for more details circle 117 on postcard



# The Seven-Year Itch.

Remember when we introduced you to our Television Analyst (model 1076)? That was over seven years ago, and she's still the only diagnostic tool of her kind. But now there's a new number. A smart looking, professional model (1077) with designs on your heart.

Sure your old model still works. Why not? It was made by B&K.

But, of course, she can't do some of the groovy things the new model can do. Like testing TV sets with UHF. And testing transistorized TV sets with complete safety by matching the impedances of transistorized circuitry.

The 1077 analyzes every stage in color and black-and-white TV sets—without external scopes or wave-form interpretation. And

she does it with a standard test pattern (or special pattern slide transparencies for color circuitry), all of which we supply. She does it all: from antenna input terminals to the grid of the picture tube, using the unique B&K signal substitution technique.

When you do get together with our Television Analyst, she'll eliminate those hours you wasted on tough dogs, intermittents and general TV troubleshooting. (Hours for which you often don't charge the customer.)

Here are some more of her good points: VHF and all UHF RF channels; IF; video; sync; chroma;

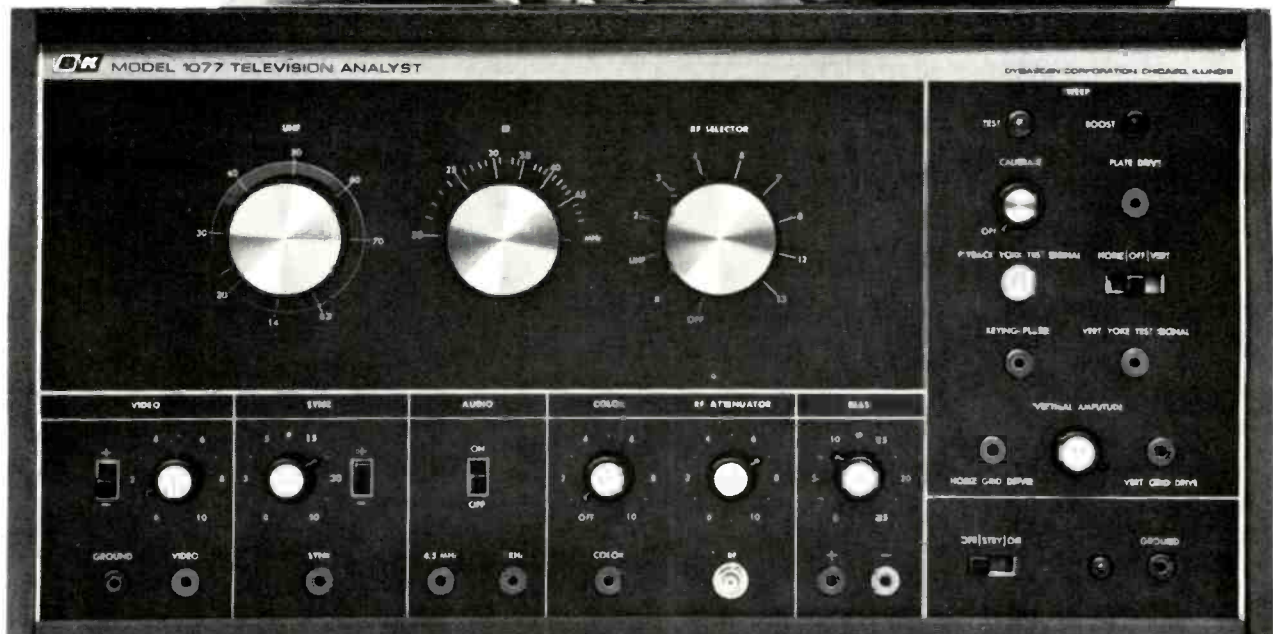
audio; bias supply; AGC keying pulse; and signals for complete analyzing of sweep circuitry, including flyback yoke test, and horizontal and vertical driving signals.

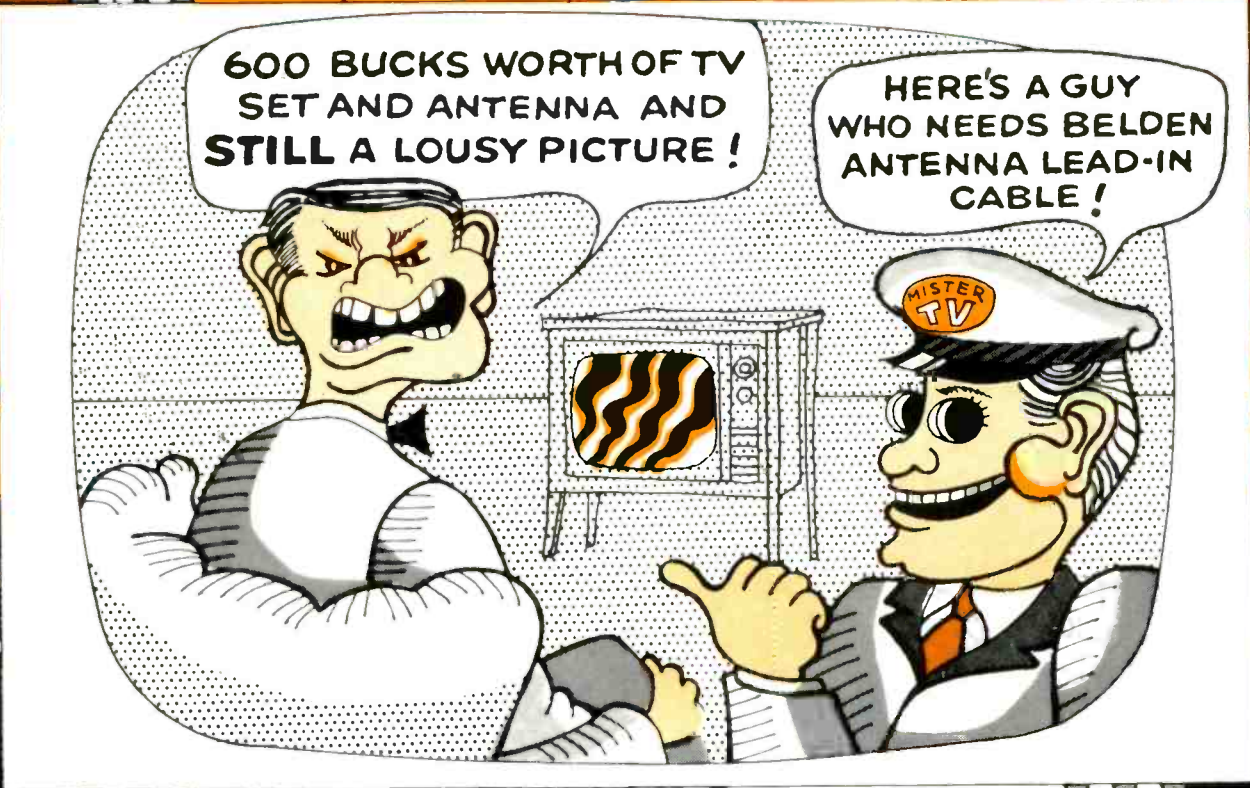
Got the itch? Contact your distributor for complete details on how to start a new life with a Television Analyst. Or write for Bulletin 1077.

**Model 1077. Net \$379.95**



A Division of DYNASCAN CORPORATION  
1801 W. Belle Plaine • Chicago, Illinois 60613  
Where electronic innovation is a way of life.





Color or UHF set perfect? Antenna perfect? Then obviously there's a missing link. Check that antenna lead-in cable. Old, worn-out, weather-beaten cable, or the ordinary flat ribbon kind designed for black and white VHF, causes more fuzzy, distorted pictures than you can count. It's your opportunity to upgrade these customers to a cable matched to their particular signal reception situations. One of Belden's Big Four—the link to perfect reception.

FOR CONGESTED AREAS...  
**8290 SHIELDED PERMOHM®**



In congested, in-city areas, stray electrical interference and noise are at their worst. For perfect, all-82 channel reception—color or B/W—replace old cable with Belden's 8290 Shielded PermoHM. Its aluminum Beldfoil® shielding prevents pickup of ghost signals and electrical noise by the lead-in. Weather-proof and water-proof. You can tape it right to the mast. Or install it underground, in conduits—even in rain gutters.



AWG & (Stranding)	Color	Nom. O. D. (inch)	Nom. Velocity of Propagation	Nom. Capacitance (mmf/ft.)	Nom. Attenuation per 100' db	Standard Package Lengths in ft.	
22 (7 x 30)	Brown	.305	69.8%	7.8	57	1.7	50', 75', 100' coils have terminals attached. Available in counter dispenser. 250', 500' spool.
		.515			85	2.1	
					177	3.2	
					213	3.5	
					473	5.4	
					671	6.6	
	887	7.7					

Copperweld, 2 conductors, orange polyethylene insulation and web between conductors, cellular polyethylene oval insulation, Beldfoil shield, stranded finned drain wire, polyethylene jacket.

BELDEN 8285 - PERMOHM

FOR FRINGE AREAS...

## 8285 PERMOHM®

Antenna cable in uncongested or fringe areas picks up little electrical interference. But does get a lot of weathering, which degrades an already weak signal. These customers need encapsulated cable. Belden 8285 Permohm. Its special polyethylene jacket protects the energy field, regardless of weather conditions. It delivers the strongest signal of any unshielded twin lead under adverse conditions. Requires no matching transformers and connectors. For all 82 channels, color or B/W.

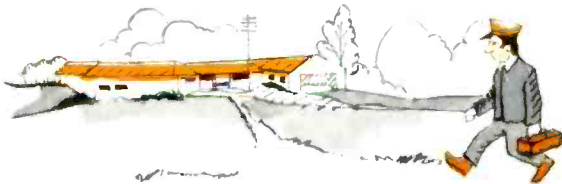


AWG & (Stranding)	Color	Nom. O. D. (inch)	Nom. Velocity of Propagation	Nom. Capacitance (mmf/ft.)	Nom. Attenuation per 100'		Standard Package Lengths in ft.
					mc	db	
22 (7 x 30)	Brown	.255 x .468	73.3%	5.3	100	1.4	50', 75', 100' coils have terminals attached. Available in counter dispenser. 250', 500' coils and 1000' spool.
					300	2.8	
					500	3.8	
					700	4.8	
					900	5.6	

Copperweld, 2 conductors parallel, orange polyethylene insulation and web between conductors, cellular polyethylene oval jacket.

FOR LOCAL BLACK AND WHITE...

## 8275 CELLULINE®



Cracked, corroded, weathered cable, full of dirt and moisture, loses signal strength; prevents any TV set from delivering a quality picture. Upgrade B/W VHF and local UHF customers to Belden 8275 Celluline. Performance is improved because all possible moisture between conductors has been eliminated. Abrasion-resistant and weather-resistant for a long, long service life. And, it requires no end sealing.

AWG & (Stranding)	Color	Nom. O. D. (inch)	Nom. Velocity of Propagation	Nom. Capacitance (mmf/ft.)	Nom. Attenuation per 100'		Standard Package Lengths in ft.
					mc	db	
20 (7 x 28)	Brown	.300 x .400	80%	4.6	100	1.05	50', 75', 100' coils in counter dispenser. 250', 500', 1000' spools.
					200	1.64	
					300	2.12	
					400	2.5	
					500	2.98	
					700	3.62	
900	4.3						

Bare copperweld; 2 conductors parallel, polyethylene jacket with inert gas filled unicellular polyethylene core.

DUOFOIL

FOR MATV AND CATV...

## 8228 DUOFOIL® COAX

Got an apartment or townhouse complex in your area? Motels or hotels? Or is CATV coming? Use Belden's new 75 ohm coaxial cable—8228 Duofoil. Shielding is 100%—sweep tested 100%. Spiral wrapped drain wires provide long flex life. Small diameter saves space in conduit installations. Use Duofoil for all coaxial color and B/W VHF, UHF and CATV applications.



AWG & (Stranding)	Color	Nom. O. D. (inch)	Nom. Velocity of Propagation	Nom. Capacitance (mmf/ft.)	Nom. Attenuation per 100'		Standard Package Lengths in ft.
					mc	db	
18 Solid, Bare	Black	.242	78%	17.3	50	1.5	100', 500', 1000' spools.
					100	2.1	
					200	3.1	
					300	3.8	
					400	4.5	
					500	5.0	
					600	5.5	
					700	6.0	
					800	6.5	
					900	6.9	

Don't forget to ask them what else needs fixing.

See your local Belden distributor for full details or to order. For a free copy of the recent reprint article, "Electronic Cable," write: Belden Corporation, P.O. Box 5070-A, Chicago, Illinois 60680.

**BELDEN**

B-6-B-1

# Dyna-Probe

New King-Size,  
Hi-Voltage Tester With  
2% Accuracy At 25,000 Volts!



B&K is proud to introduce Dyna-Probe, the new, longer, safer length, hi-voltage tester designed to give more accurate voltage readings. Servicemen carry Dyna-Probe to in-home jobs—adjust high voltage with greater accuracy, thus relieving customer fear of color TV X-ray radiation. Detachable meter is easy to read in "hard-to-reach" areas. Meter, on auto-tilt stand, direct-reads 0 to 30,000 volts. Dyna-Probe—another engineering breakthrough from B&K.

Model HV-30, \$24.95 user net



**B&K Division of Dynascan Corporation**  
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Where Electronic Innovation Is A Way Of Life

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ET/D

## LETTERS TO THE EDITOR

### Vectorscope Error

I would like to say "Sock It To 'Em" regarding your replies in Letters to the Editor, November 1968.

I want to be among the many who praise your magazine from cover to cover. I am a subscriber and will continue to be as long as the material in your magazine is of the quality it has been.

Your article on vectorscope servicing in November 1968 has an error on page 44. It states in reference to a Zenith TV "a 6v source should be applied to point C1, the ACC." It should read "test point Q1" as C1 is the output of the video detector.

FRANK KOLDE, JR.

Chesterfield, Ind.

### Business Anyone?

May we take this opportunity to thank you for the excellent trade magazine you make available. More than once a problem has been sitting on our benches when your magazine arrived and solved the problem for us. The articles are timely and well written.

We would like to provide an opportunity to one of your readers who might want to lease or buy a going television service business established for five years in the fastest growing county in the United States, Orange County, California.

The area serviced is in the medium high to high income group. There is no limitation as to potential growth. The business is situated in the central part of the county with access to the complete freeway system nearly at the door.

The shop is equipped with all the latest equipment and currently running two trucks for service and antenna installations.

We would like to have inquiries from any of your readers that might like to make a change. We would provide financial information to interested principals. We will require financial information on anyone interested. All inquiries will be treated in confidence.

MARVIN LEHRER

Bayview Electronics Service  
20056 Santa Ana Ave.  
Santa Ana, Calif.

### Readers' Aid

I wonder if one of your readers can tell me where I can get the tube layout for a German radio. It is a Phillips Capella #673. The tubes of this set

were removed by a child and I have no way of knowing what's what. I also am looking for a wiring diagram for a Navy receiver (long wave); Type Cnd 64155, radio receiver serial 1934; A unit of model Rak-2 radio equipment manufactured for the Navy Dept. Bureau of Ships by Andrea Radio Corp., contractor RCA, Camden, N.J. Contract NX sr 38089. I sure would like to get these pieces of information if possible.

STANLEY MAGALSKI

Stan's Electric  
Kensington, Ks.

I have a DeVry 5 in. oscilloscope for sale. It needs some repairs but it's a good scope. I am moving and want to sell it before I leave. Maybe one of your readers would be interested.

HARRY SCHUH

H&H TV Radio  
135-09 83rd Ave.  
Kew Grdns, L.I., N.Y. 11435

I have some Rider's TV Manuals, Volume 3 to 8, just like new and some were never used. I would like to sell them for \$1.50 each, if one of you readers could use them. I would prefer a local serviceman so he can pick them up.

AL CRISPO

159-30-90 St.  
Howard Beach, N.Y. 11414

Perhaps an ELECTRONIC TECHNICIAN/DEALER reader can help me find a schematic (wiring diagram) for a DOSS—Pioneer 250 Horizontal Quantalyst.

I would appreciate any help from your readers.

My best to all and many thanks for all the fine articles.

MAURICE DUBREUIL VE28U  
1740 Notre-Dame  
Lavaltrie, Que.  
Canada

I have been receiving your magazine for some time and find it very interesting and helpful. I have a problem and I was wondering if you could help me.

Three or four years ago I bought an automatic tube tester (floor model) to be used in a drugstore in town. Recently I wrote to the company that made it for a new setup chart and it is no longer in business. I paid about \$350 for it and I hate to see it become obsolete. Possibly one of your readers can give me some information to update it. The tester is a Model No. 36-800 and sold by G. C. Electronics Co., 400 S. Wyman St., Rockford, Ill. I would appreciate any assistance.

ALBERT CATALDO

Cataldo TV  
511 Main St.  
Wellsville, Ohio 43968

ELECTRONIC TECHNICIAN/DEALER

# *I'm glad you asked that question...*

Who offers the most profit in tuner service? They tested us and learned:

Would you believe PRECISION TUNER SERVICE does?

If you're one of our thousands of long-time customers, you've already had it proven to you DAY AFTER DAY.

But, if you're not, you'll want to know how we got all those happy customers—(steady, satisfied customers, that is)

- PRECISION TUNER SERVICE is dependable . . . quality work . . . no complaints . . . just conscientious service!
- PRECISION TUNER SERVICE uses only ORIGINAL PARTS . . . no home-made or make-do inferior merchandise! (This is why we charge extra for major parts!) You get your tuner back in ORIGINAL EQUIPMENT condition.
- PRECISION TUNER SERVICE is fastest! Speedy 8-hour service . . . every time. No phone calls. No wondering.
- PRECISION TUNER SERVICE is more profitable! The cost is less . . . up to \$5.50 less than other tuner service! Major parts, tubes, transistors charged at net price. UV Combos—\$14.95

**AND NOW FOR EVEN FASTER SERVICE—  
A BRANCH PLANT IN TEXAS AND CALIFORNIA, TOO!**

Why don't you test us and find out?  
Don't make it easy on us . . .

***don't give us a break!  
you get...***

***Fast 8 hr. Service!***  
***\$8<sup>95</sup>***

**1 Yr. Guarantee**

For finer, faster PRECISION TUNER SERVICE,  
send faulty tuner with tubes, shields and all  
broken parts to:



**PRECISION TUNER SERVICE**

one of the **OLDEST** and **LARGEST** tuner service companies in the country

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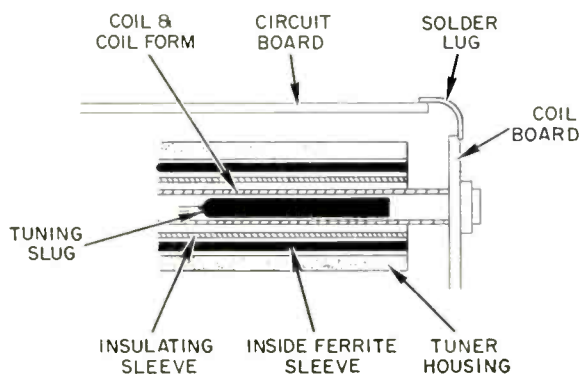
**HOME OFFICE:** 1210 S. WALNUT  
BLOOMINGTON, IND. 47401  
TEL. 812, 339-9653

**SOUTH:** 332 W. TYLER  
LONGVIEW, TEX. 75601  
TEL. 214, 753-4334

## DELCO RADIO

### Loose Ferrite Sleeves in AM Tuners

When there are complaints of radio volume going up and down, as well as static on bumpy roads, the problem may be that one of the ferrite sleeves in radio tuner is loose. When a sleeve comes loose, it slides back and forth detuning the radio and causing the volume to vary. Occasionally, it may slide forward enough to short cut coil leads causing static. When the radio is standing face up and the back bumped gently against the bench, the loose sleeve will move down and be visible between the tuner housing and coil board.



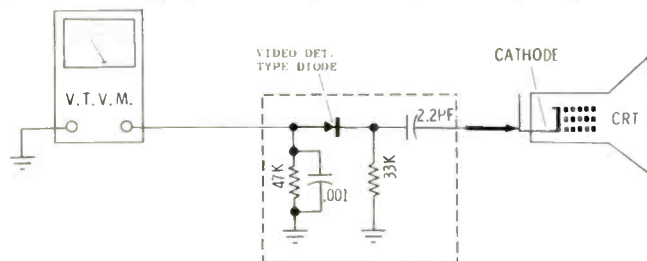
The correction is to replace the tuner assembly with a new one. The tuner cannot be repaired because the coil board is permanently staked to the tuner housing.

## MOTOROLA

### Alternate Method of 4.5MHz Trap Alignment in Solid-State B/W Receivers

In some chassis the visual MHz trap alignment may be critical because of its sharp attenuation characteristics.

The following method of alignment may be used by employing a VTVM and a 3.58MHz demodulator. This is the same demodulator used in the 3.58MHz trap alignment



on TS914, 918 and 921 tube type color chassis. If a demodulator is not available, one should be constructed as shown. Alignment Procedure: (1) Connect the VTVM and demodulator. (2) Tune receiver to snow-free picture. Fine tune to near burble. Set optimizer or video peaking control to maximum (optimum high frequency response). (3) Start with 4.5MHz trap core at top of coil. Tune for maximum attenuation (minimum reading) at first dip on meter.

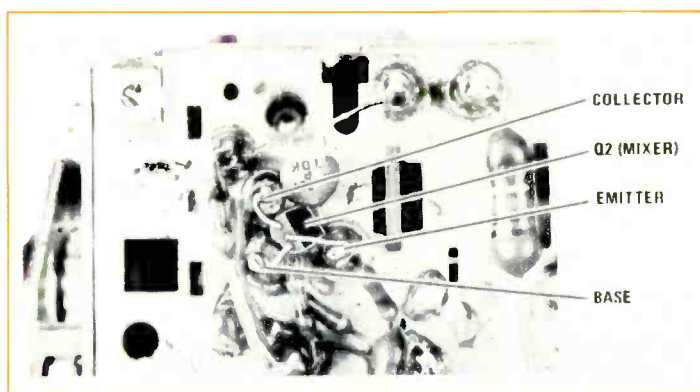
### Color TV TS915/919—Service Tip

*Symptom:* White vertical line on left side of raster ap-

pears to be a drive line. Generally not noticeable with picture. Usually can be seen at low video level—particularly on blank raster. *Cause:* Suppression in emitter circuit of horizontal output transistors Q6F and Q7F must be increased. *Solution:* Replace ferrite beads in emitter circuit of horizontal output transistors Q6F and Q7F. Order Part No. 76A544401 from your local distributor. Six ferrite beads are required. Remove heat sink from horizontal output panel "F" to gain access for replacement.

### TV Chassis TS592/612 VHF Tuner TT409—Transistor Replacement

*Symptom:* Raster, no video, no sound (noise only). Raster good with slight snow. *Cause:* Open Q2 (A2H) mixer transistor in tuner. Shorted Q2 (A2H) mixer transistor in tuner. *Solution:* Replace transistor with Motorola Part No. 48S134950. Mixer transistor replacement on VHF tuner TT-409 may be made on the top of the tuner. Unsolder and



remove shield from top of tuner. Position replacement transistor bottom side up between feed through terminals as shown in photo. Observe correct polarity and keep leads as short as possible. Wrap leads around feedthrough terminals and solder. Replace shield and solder. If it has been ascertained that the original transistor is defective, it may be removed without unsoldering. Grasp transistor leads adjacent to terminal with long nosed pliers and twist off.

### FM Stereo Alignment

Requirements for the FM stereo receiver are far more stringent than monaural FM sets. To obtain good stereo separation (approximately 30db), alignment must be precise and good FM AFC is a must.

To support our method of FM IF alignment, a brief review of parallel tuned circuits is in order.

One fundamental law of parallel resonant tuned circuits states: At resonance (10.7MHz in the FM IF), the "Q"  $(Q = \frac{X}{R})$  is at maximum. Since this resonant frequency also

contains random noise, we can simply tune the FM set off station for noise and peak all the FM IF's for maximum noise from speaker.

The following method is suggested and does not require accurate test equipment.

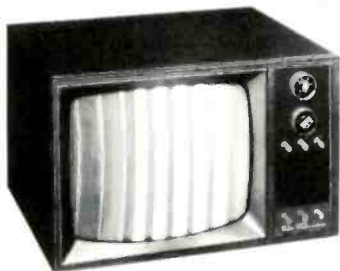
### FM IF Alignment

1. Set FM radio to an unused frequency on the dial.
2. With the volume control turned up, adjust all the FM IF's for maximum noise from speaker.

You're making money in electronics now.

**RCA offers 4 ways to make more.**

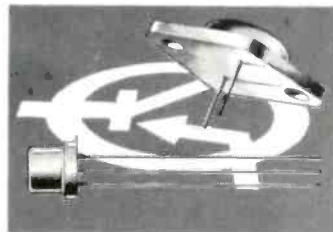
**Study at home . . . set your own pace.  
RCA Institutes has an easy approach  
to bring you bigger earnings.**



**COLOR TV** During this course you'll perform over 50 experiments—and receive all parts and instructions to build your own color TV.

The cost of the Color TV Kit is included in the tuition—in both the beginner's program and the advanced course in color TV servicing.

Course is based on the latest receiver circuitry and equipment.



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# ET/D TECHNICAL DIGEST

## FM Tuner Alignment

1. Connect VTVM (set to zero center scale-low volts range) across FM detector output.
2. Tune to a weak FM station.
3. With radio dial pointer on correct station frequency, adjust oscillator coil for zero meter reading.
4. Connect VTVM to FM limiter input.
5. Adjust antenna and RF coils for minimum meter reading. (On tube-type sets this voltage will be negative, in which case adjust the coils for maximum negative meter reading.)

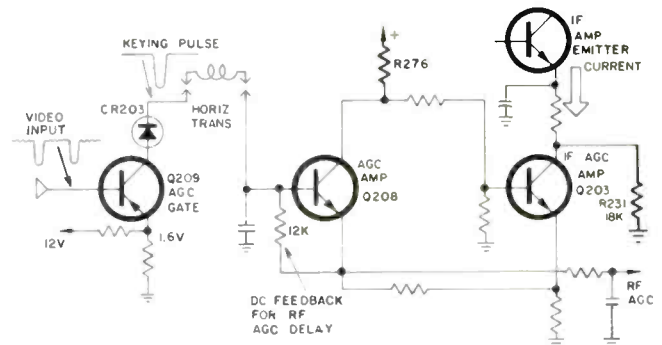
## FM Stereo Alignment

1. Tune to a weak FM stereo station.
2. Set the separation control midway between the point where the stereo light goes out and the audio becomes noisy or distorted.
3. Adjust the 19kHz and 38kHz coils for maximum stereo light intensity. On auto radios and some stereo models the intensity of the stereo light will not vary with tuning. In these cases use a VTVM connected to the output of one of the stereo detector diodes. Adjust the 19kHz and 38kHz coil for maximum meter reading. (Meter reading can be positive or negative, depending on which diode is being monitored.)
4. Do not attempt alignment of the 53kHz and 67kHz "store cast" traps unless an accurate signal generator is available.

## RCA VICTOR

TV Chassis KCS169—Automatic Gain Control AGC Circuit Description

AGC is derived through the action of three transistors — an AGC gate, AGC amplifier, and IF AGC amplifier. The base of the AGC gate receives video information while the collector receives negative going pulses from a special winding on the horizontal output transformer. These pulses act to "turn on" the AGC gate coincidentally with the incoming horizontal sync pulses. The degree of conduction of the AGC gate (and therefore the developed AGC voltage) is proportional to the amplitude of the sync pulses contained in the video signal input. The blocking diode, CR203, in









series with the collector of this transistor prevents forward biasing of the transistor collector-base junction. A 1.7v reference voltage on the AGC gate emitter prevents this transistor from conducting until the sync tips applied to the base drive the transistor into conduction.

Under no-signal conditions, the AGC gate (receiving no video information) does not develop forward bias for the AGC amplifier. Q208; with Q208 in a cutoff condition the voltage drop across R276 is minimal, causing a forward bias condition of the IF AGC amplifier, Q203. As a result, Q203 conducts heavily, the 1st video IF draws maximum

Continued on page 38

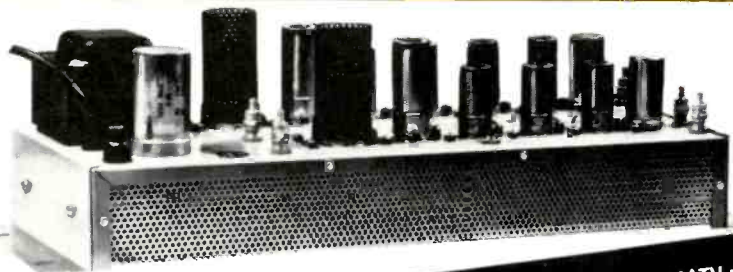


<b>M-11</b>  Solid State Units All Silicon Transistor VHF-FM Preamplifier - 20 dB, 300 ohm In - 75 ohm Out	<b>M-19</b>  Solid State Units All Silicon Transistor FM Preamplifier - 20 dB, 75 ohm In - 75 ohm Out	<b>M-116</b>  Solid State Units 82-channel solid state - 25 dB Dist. Amplifier Separate UHF and VHF 75 ohm inputs.	<b>M-118</b>  Solid State Units All Silicon Transistor VHF-UHF Home Amplifier - Four 75 ohm Outputs	<b>M-108</b>  Solid State Units All Silicon Transistor VHF 40 dB Distribution Amplifier	<b>M-403</b>  Solid State Units UHF to VHF Crystal Controlled Converter
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Written to give specific instructions for using the oscilloscope in servicing TV receivers and other home-entertainment equipment, numerous waveform photos are included to show ideal results, plus displays indicating circuit troubles and improper equipment setup. In all, complete information is included for performing 99 different analysis tests, encompassing just about every application a service technician might encounter.

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#### Modern TV Circuit & Waveform Analysis

Here's a new book for professional

TV service technicians, emphasizing the use of a triggered-sweep oscilloscope to diagnose TV circuit troubles efficiently. Written by 20-year veteran Stan Prentiss, the text explores the newest transistorized, integrated circuit, and tube-type receivers—both color and monochrome—while not completely ignoring the tried-and-true “reliables” of the past. The author explains how individual circuits work and shows you the waveforms that should appear at strategic points, using as examples the circuitry encountered in most TV sets manufactured today.

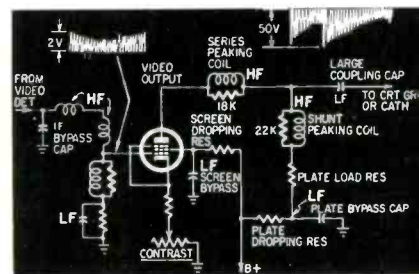
By simply referring to the more than 100 waveforms, complete with peak-to-peak and time base designations, you can quickly locate a circuit malfunction, and with the text analysis and waveform comparison you can put your finger on the defective component in short order. For those technicians who are interested in further developing their ability, the author has included a wealth of data on how to troubleshoot semiconductor circuits.

The content begins with an analysis of basic waveforms and typical waveforms found in the average TV set. Succeeding chapters deal with RF-IF circuits, second detector and video amplifier circuits, sync and AGC, vertical and horizontal deflection systems, audio circuits, and chroma circuits. Each chapter includes functional descriptions of various circuit types, the troubles you may encounter, and the waveforms you should observe when such troubles occur. The final chapter discusses techniques for troubleshooting solid-state circuits by explaining, in an easy-to-understand manner, what happens when certain defects develop in specific circuits. Also included are 15 solid-state troubleshooting charts.

Here is the information you must have if you are to keep up with the ever-increasing pace of new developments. If you plan on staying in the business of electronics servicing, you need this book!

#### Repairing Transistor Radios

Here is everything you need to know



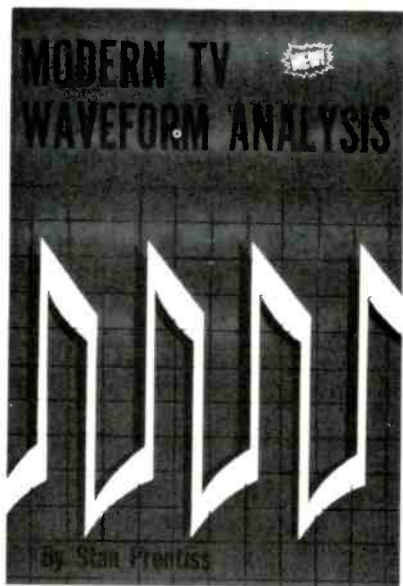
Literally scores of easy-to-use schematic diagrams are contained in all these new books. (Example shown greatly reduced in size)

about transistor circuits, and how to troubleshoot and repair any type of transistor receiver—FAST!

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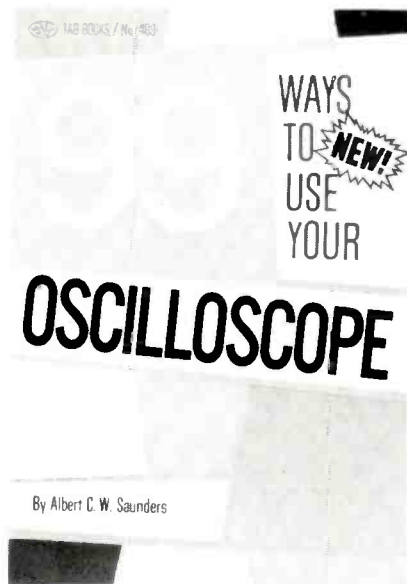
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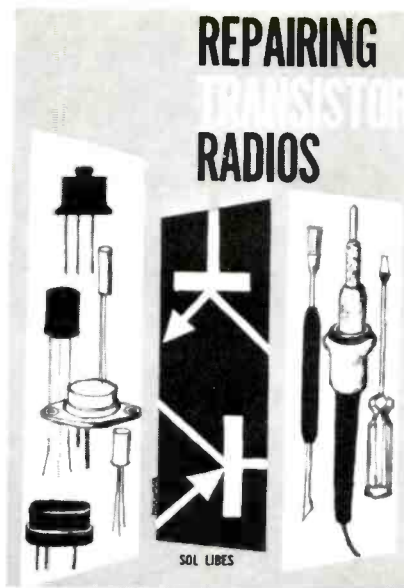
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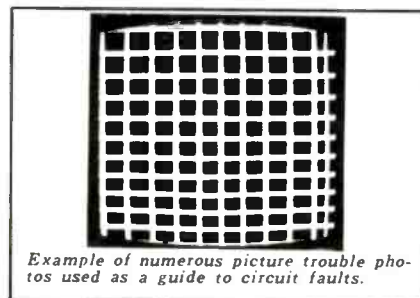
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Example of numerous picture trouble photos used as a guide to circuit faults.

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current (9.5ma), and its gain is at maximum.

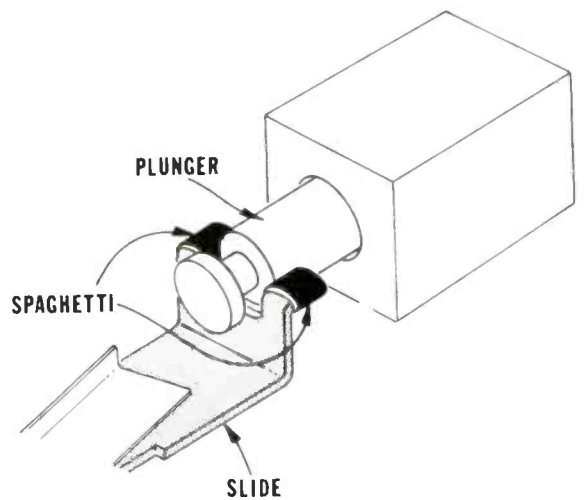
The RF AGC voltage is developed at the emitter of Q208. Under no-signal conditions (with Q208 not conducting) the emitter voltage is at a minimum value of 1.7v. This voltage applied to the RF stage acts to hold its gain at maximum.

When signal strength is increased, the AGC gate (and therefore the AGC amplifier) starts to conduct. This action reduces the forward bias on the IF AGC amplifier, reducing its conduction; reception of stronger signals will act to progressively reduce conduction until emitter current is determined only by the 18K emitter return resistor. At this time the gain of this stage is at minimum. When the IF AGC amplifier is cut off, the AGC amplifier, Q208, supplies bias voltage only to the RF stage. AGC delay is accomplished by a feedback network from the collector of Q208 to the base of Q203. Courtesy of RCA Sales Corp.

## DELCO RADIO

1968 Buick T-400 Tape Players 68T-2 - Rattles

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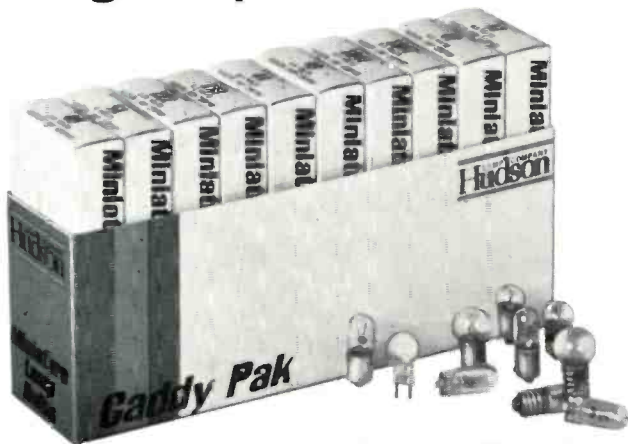
when traveling over a rough road. Correction: As shown, cut a 3/16in. piece of two sizes of spaghetti to fit over the "bumper ends" of the slide. The spaghetti should be relatively thick so as to actually touch the neck of the plunger, or install a new slide package 1222930.

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When a T-400 tape comes in with the motor running fast, don't be too quick to condemn the DS-509 motor speed control transistor as being shorted. Burrs on the casting of the T-400 Player, under the transistor, have been found to be shorting the collector to ground causing the transistor to appear shorted in circuit. Be sure to check the DS-509 out of circuit before replacing it, otherwise you may be scrapping a good part. The shorts may be removed by removing any burrs in the area where the transistor mounts and replacing the mica insulator. A special short screw is used in the wrap-around. Failure to use this screw will result in a shorted transistor.



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ELECTRONIC TECHNICIAN/DEALER

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The slide projection system eliminates the noisy projector, movie screen and the need to darken the room to present your B/W or color slides.

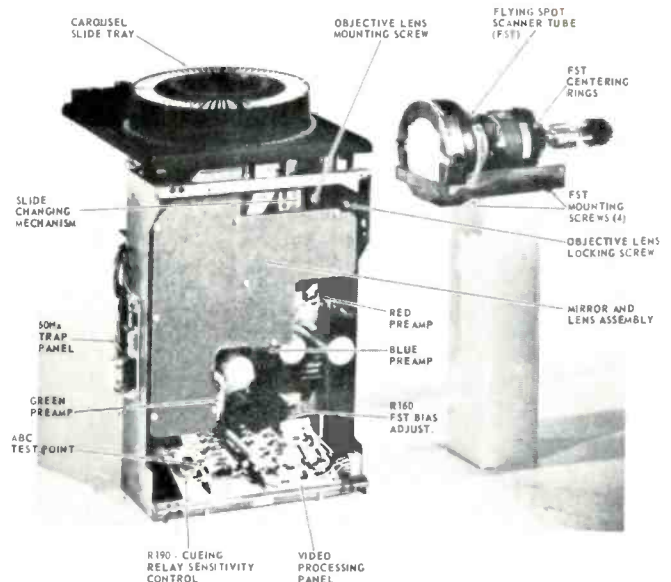
The tape recorder and the slide projection system can be synchronized to prepare slide presentations with taped narrations and also change the slides electronically on cue.

A circular slide tray can accommodate eighty 2 by 2 in. color or B/W slides. A small cathode ray tube, called a "flying spot scanner" is used to transmit the photograph from the slide to the TV set screen. Color signal processing for viewing 35mm slides is quite similar to traditional processing of color signals in a color TV camera.

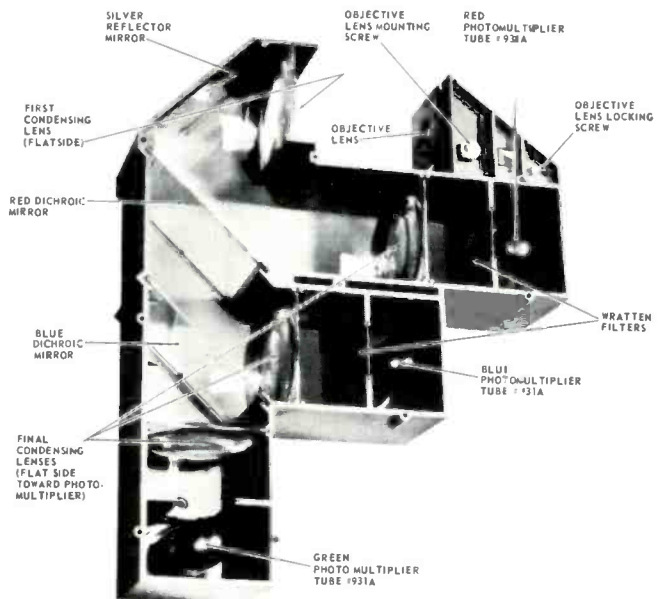
### Slide Projection Mode of Operation

When the TV set is turned "ON" and the slide scanner section function switch is in the "UP" position, two 4-pole double throw switches are actuated. These switches insert monochrome "Y" and color "X and Z" signals into the normal television circuitry from the slide information processed in the H01 chassis. All circuits of the D13 TV chassis remain energized during slide presentation.

The slide being projected is scanned by a high resolution 5 in. CRT which is also the light



Flying Spot Scanner major units (courtesy of Sylvania).



Sylvania's Scanner Color Slide Theater mirror and lens assembly

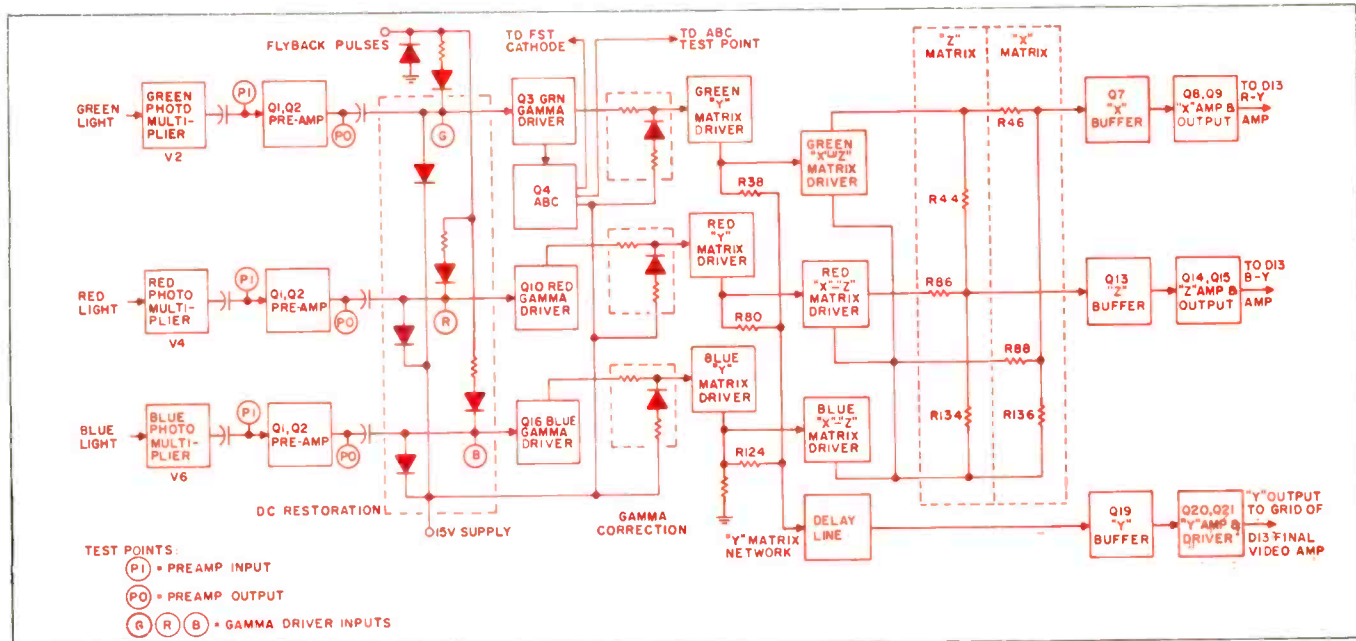


Fig. 1--Scanner functional block diagram.

source. This light is projected through the slide to a lens and mirror arrangement. Separation of the three primary colors is accomplished by dichroic mirrors and Wratten filters. Dichroic mirrors have the property of reflecting some colors and passing others. Wratten filters absorb the undesired colors.

The filter is placed in the light path of the red and blue photo-multiplier tubes. The purpose of these filters is to insure that only pure primary red and blue light reaches the photomultipliers. The dichroic mirrors do not provide perfect filtering, therefore, the filters are used to remove any remaining colored light impurity that may be mixed with the basic color. The green light is sufficiently pure and does not require a filter.

Each of the three separated light primaries is then directed onto a corresponding photomultiplier tube. The photomultiplier tubes provide large amplification of the color signals. Each of their outputs is then fed to a two-stage preamplifier panel. A functional block diagram is shown in Fig. 1. There is an accessible gain adjustment for each photo multiplier tube to set a white balance. Automatic brightness compensation (ABC) for each pro-

jected slide is accomplished by supplying a dc feedback voltage to the scanner tube cathode. Feedback voltage is derived from the average brightness information of the green channel. This voltage compensates for brightness variations which occur from one slide to another. It is advisable to have the TV tuned to a station during operation of the scanner. This will provide sync signals to the receiver. Improved interlace and scanning stability is obtained when the horizontal and vertical oscillator stages are locked in by a station signal.

### Photomultiplier Tube Operation

Photomultiplier tubes employ photo emission and secondary electron emission for their operation. Incident light from the scanner system is directed to the photomultiplier cathode after passing through the associated lenses and filter. This incident light releases electrons from the cathode. These electrons are accelerated and directed to a secondary emission surface called a dynode. Several electrons are emitted from the dynode for each incident primary electron. These secondary electrons are then directed to the next dynode where addi-

tional electrons are emitted. This process is repeated nine times to give a final electron current as high as 100,000 times the initial electron emission from the photo cathode.

The power supply for the photomultiplier tubes consists of a regulated -270v source and a +300v source to give a total of 570v plate to cathode voltage. The 570v is applied across the entire string of voltage divider resistors.

Each photomultiplier tube output is fed to a two-stage pre-amplifier through a coupling capacitor. A gain of 60 is provided for each color signal by the preamplifiers.

The output of the preamplifier panel is first dc restored, then applied to the gamma driver stage on the video signal panel. This is an emitter follower amplifier that serves as a buffer between the gamma corrector diode network and the dc restorer circuits.

### Flying Spot Tube (FST) Circuits

The circuits shown in Fig. 2 describe support circuitry for the flying spot scanner tube. It should be noted that the scanner yoke coils obtain deflection power from the TV receiver to insure proper synchronization.



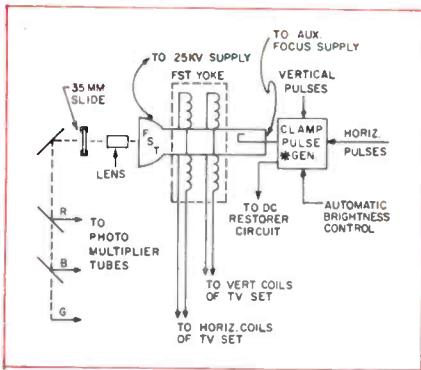


Fig. 2--Flying Spot Scanner Tube (FST) support circuitry.

The 25kv is also derived from the receiver's high voltage power supply. The FST focus voltage is derived from the TV receiver focus circuit although a similar separate rectifier diode and control is used.

The clamp pulse generator receives horizontal pulses from a flyback winding and vertical pulses from the vertical output plate. The pulses are shaped by this circuit to provide gate pulses for the dc restorer and a blanking signal for the flying spot tube cathode.

### DC Restorer Circuit

The scanner's video signal with positive blanking pulses is ac coupled to a gated dc restorer. In Fig. 3, flyback pulses from the convergence winding are clamped and shaped by diode SC900. The resulting positive pulses fed through resistor R22 are clamped by restorer diodes SC2 and SC4. This keeps the blanking level at the junction of SC2 and SC4 slightly above 15v. The same applies to the other two channels (Blue and Red).

### Gamma Correction Circuit

The basic purpose of the gamma correction circuit is to attenuate picture highlights and provide relatively large amplification of low luminance video. This compensates for the reverse characteristic of the CRT which ordinarily has large highlight gain and poor lowlight gain.

The gamma correction network, consisting of a diode SC20, a 10K resistor R116 and a 1.5K

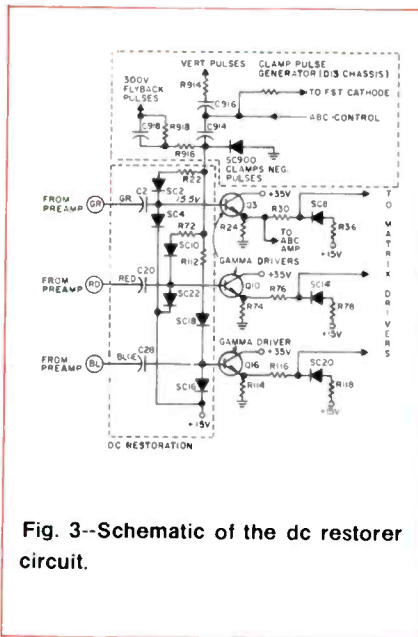


Fig. 3--Schematic of the dc restorer circuit.

resistor R118, is connected between the base of each matrix driver and referenced to the +15v line.

Fig. 4 shows the over-all gamma correction network and Fig. 5 shows the gamma correction network for the blue color channel only. The reference voltages shown on the base and emitter of Q16 and Q17 (Fig. 4) represent black level which may be approximated by inserting a black slide into the scanner. When the color video for each channel is applied across this network, the negative going highlight information biases "ON" the series diode (SC20) to cause increasing attenuation. As the signal falls into the darker and black regions this attenuation decreases. The black portions of the video between black level (15vdc) and 14.5vdc are unaffected and the white portion below 14.5vdc is attenuated. Any voltage less than 14.5vdc will tend to turn "ON" the diodes, thereby allowing greater attenuation. The lower the voltage goes the greater will be the attenuation.

### 'Y' Matrixing and Amplification

Matrixing is accomplished in three separate resistive networks to produce "X," "Z" and "Y" signals. "Y" matrixing follows

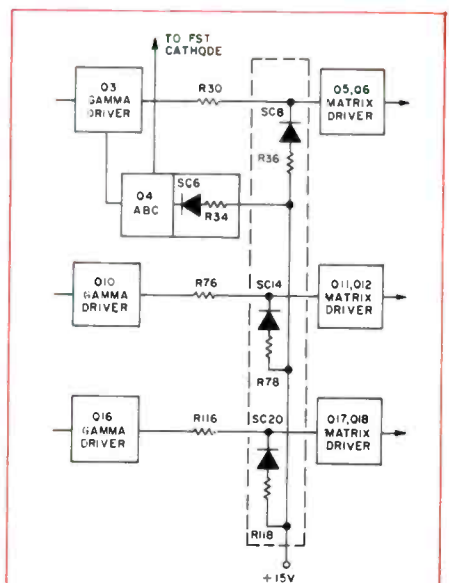


Fig. 4--The gamma correction network.

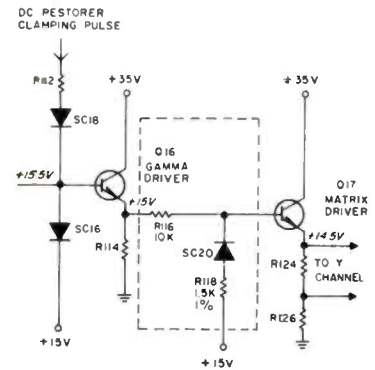


Fig. 5--Schematic of the blue color channel gamma correction network.

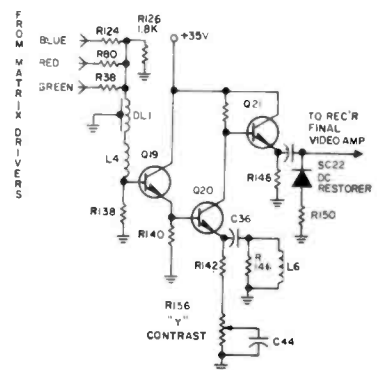


Fig. 6--"Y" matrixing.

the NTSC system standard while "X" and "Z" matrixing produces color signals equivalent to the output of the receiver "X" and "Z" demodulators.

The "Y" signal is obtained by adding the appropriate amount of R G & B signals in a resistive matrix circuit (see Fig. 6) consisting of R38, R80, R124,

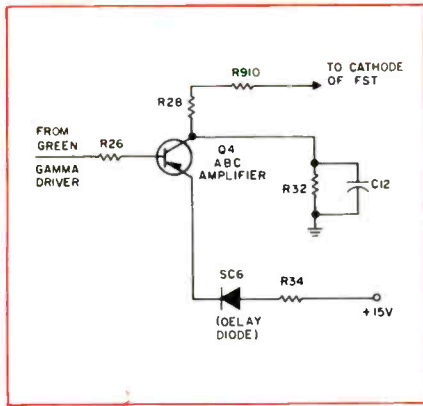


Fig. 7--Automatic Brightness Control Circuit (ABC).

R126 and R138. The parallel combination of R126 and R138 form the common resistor of the matrix.

$$Y = .59G + .30R = .11B$$

This signal is delayed by DL1 and applied to buffer amplifier Q19. This stage serves as a buffer and impedance matching between the Y amplifier, Q20, and the matrixing inputs. Q20 drives the video "Y" output driver Q21. The video "Y" output driver provides the "Y" signal output to the TV receiver video stage. dc restoration for the "Y" signal is developed by SC22 and R150. The contrast control is located in the emitter of Q20. The output of each gamma correction network is applied to a "Y" matrix driver. This is an emitter follower stage which is coupled to the matrix drivers. Each color channel is similar except a video peaking network consisting of L2 and C14 is placed in the emitter circuit of Q5. This network provides peaking of video frequencies near 3MHz for greater picture detail. A similar circuit, C36 and L6, at Q20 in the "Y" channel also serves the same purpose.

### Scanner 'X' and 'Z' Matrixing

It is necessary to produce "X" and "Z" signals to drive the grids of the R-Y and B-Y amplifiers in the color receiver. These signals are matrixed by outputs from matrix drivers Q6, Q12 and Q18 in the following proportions:

$$X = 3R - 3.1G + .1B$$

$$Z = .57R - 1.66G = 2.23V$$

$$Y = 59G + .30R + .11B$$

### 'X' Matrixing

The "X" signal which consists primarily of red and green signal information is matrixed at the base of the "X" buffer amplifier Q7.

The "Z" signal is made up primarily of blue and green signals and is matrixed at the base of "Z" buffer amplifier Q13 by R44, R86 and R134.

### Automatic Brightness Control Circuit

A satisfactory reference for automatic brightness control (ABC) operation is obtained by using only the green video signal to control the brightness bias level. This is possible since green is the largest contributor to the brightness information (Y signal). The green gamma driver provides a dc restored video input to the ABC amplifier base (see Fig. 7). The collector lead of this stage is shared with the cathode of the flying spot tube (FST). This causes the cathode bias to vary with signal under certain conditions. The emitter circuit of PNP transistor Q4 is coupled through diode SC6 and resistor R34 to the +15v reference line. It can be seen that any time the base of Q4 is more positive than +15v, the transistor is off. Also, diode SC6 will be biased off whenever the emitter of Q4 becomes more

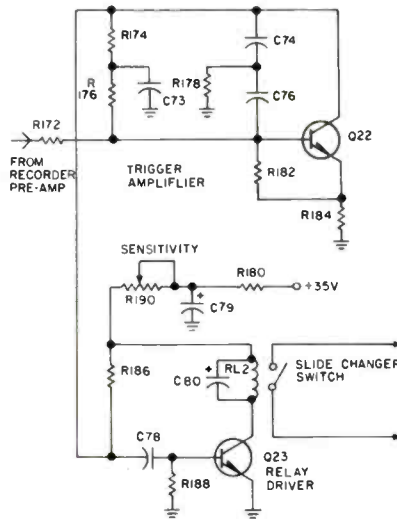


Fig. 8--The 60Hz "Beep" circuit for automatic slide change.

positive than the +15v reference line.

Nominal collector voltage with Q4 cut off is approximately 1v since the FST beam current (through R32) is 100μv. If a video signal of considerable brightness is applied to the base of Q4, a large portion of the signal will be of negative polarity and Q4 will be turned on. This occurs after the "TURN ON" voltage of SC6 and Q4 is exceeded. When Q4 conducts, its collector will go more positive because of the increased drop across R32. This voltage in the FST cathode circuit will tend to "bias off" the scanner tube. Diode SC6 provides some initial delay before Q4 can begin conducting to allow extra brightness on dark or nearly opaque slides.

### Automatic Slide Changing and Cueing

It is quite easy to record a complete voice narration of the slides as they are presented. This is accomplished by depressing the hand-held slide change button for approximately 1/2 second after each narration is recorded. A 60Hz "Beep" will automatically be recorded on the tape when the forward button is depressed, then the next slide will appear. The playback action will duplicate the record sequence since the 60Hz cueing "Beep" will actuate the slide change mechanism during playback. The duration of the audible "Beep" tone will last approximately 1/2 second. It is fed from the recorder preamp through a trigger amplifier circuit (Q22) (see Fig. 8) to the relay driver stage (Q23) which actuates the slide change relay. The cueing "Beep" must pass through a sharply responsive twin "T" 60Hz band-pass filter which will reject all frequencies other than the recorded 60Hz tone. Relay driver stage Q23 is provided with a sensitivity control (R190) which should be adjusted, if necessary, to prevent spurious or false triggering of slide change relay RL2. ■

# Selling and Installing MATV Systems

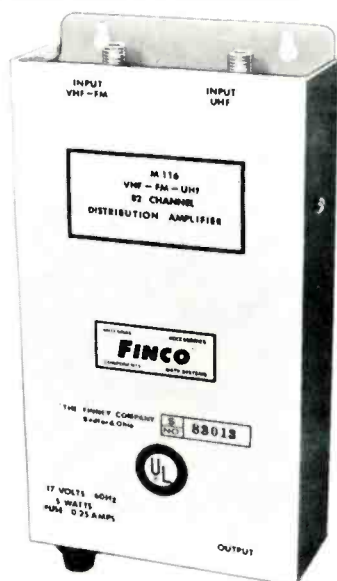
Part seven of this series continues the listing of MATV equipment manufacturers including specifications

■ Part six of this series (Electronic Technician/Dealer, Dec.) started the round-up of manufacturers of MATV antennas and support components ruggedized for MATV installations. Part seven concludes this round-up. Additional information on the antennas and components can be obtained by writing directly to the following manufacturers: Blonder Tongue Laboratories, 9 Alling St., Newark, N.Y.; Finco, 34 W. Interstate St., Bedford, Ohio; Jerrold Electronics, 4th and Walnut, Philadelphia, Pa.; JFD Electronics, 15th Ave. at 62nd St., Brooklyn, N.Y.; Winegard, 3000 Kirkwood St., Burlington, Iowa.

## Broadband Amplifiers, 82 Channel

**Finco Model M116** 900

Solid-state. 25db gain. Three separate power switches for power to preamps and line extenders; 75Ω in-



put and output. Low noise figure. Maximum total input 38.0dbm per channel. Combined total output is 1.4v.

**JFD Model SL-3155** 901

Solid-state; 30db VHF gain; 32db UHF gain; 54dbm output per chan-



nel at VHF (for 7 channel operation); 56dbm output per channel at UHF. Separate gain controls for low VHF band, high VHF band and UHF band (15db gain control range). Provides power for preamps and remote line extenders. Regulated full wave power supply. Modular printed circuit board construction; -30db output test jack. Time delayed circuit breaker indicates shorts. Pilot lights show where power is being supplied. Three-wire line cord and leakage paths at input and output to drain static charges. Handles sub-channels down to 20MHz.

## Cable Powered Amplifiers and Accessories

**Finco Model M26** 902

Splitter. Solid-state. Provides 9db gain at each of two 75Ω outputs. Handles all frequencies 54 to 890MHz. Works from 28vac. Passes ac for additional line powered accessories.

**JFD Model SL-6120** 903

Amplified two-way splitter. Handles all 82 channels. Provides 7.5db gain per output at VHF, 2cb gain per output at low UHF channels and unity gain per output at high UHF channels; 5db tilt control range; 26dbm maximum input and 33dbm maximum output. Solid-state. Works from 17vdc, 24ma. Passes dc.

**JFD Model SL-6140** 904

Amplified four-way splitter. Handles all 82 channels. Provides 3.5db gain per output at VHF, 1.5db gain per output at low UHF channels and -6db per output at high UHF channels; 3.5db tunable tilt control range. Solid-state. Works from 17vdc, 24ma. Passes dc.

**JFD Model SL-6300** 905

Line stretcher. Used to extend or stretch any trunk line. Handles all 82 channels. Solid-state. Provides 13.5db gain at VHF, 3.0 to 6.5db gain



at UHF. Maximum VHF input, 26dbm, maximum VHF output, 40dbm; 5.5db tunable tilt control range. Works from 17vdc, 24ma. Passes dc.

**JFD Model SL-6301** 906

Similar to SL-6300 but includes 6db gain control range.

**JFD Model SL-6310** 907

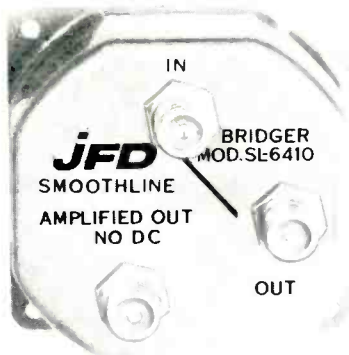
UHF line stretcher. Passes VHF and provides 12db gain at UHF; 30dbm maximum input, 43dbm maximum output; 3db fixed tilt. Works from 17vdc, 24ma.

**JFD Model SL-6311** 908

Similar to SL-6310 but includes 6db gain control range

**JFD Model SL-6410 909**

Bridger. Provides one no loss 75Ω output while feeding VHF and UHF through main trunkline. Used to establish extra trunkline to serve another building or an especially long run. Solid-state; 35db isolation between through line and tap; 40dbmv

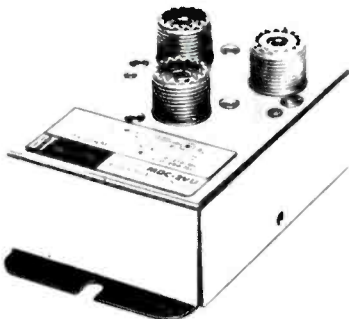


maximum input and output 1.0db through line loss. Works from 17vdc, 24ma. Passes dc.

### Passive Splitters

**Blonder-Tongue Model MDC-2VU 910**

Two-way. Indoor. Passes 10 to



890MHz plus AM band. UHF type connectors; 4.0db insertion loss.

**Blonder-Tongue Model MDC-4VU 911**

Four-way. Similar to MDC-2VU except has four outputs; 8db insertion loss.

**Blonder-Tongue Model 2SBV 912**

Two-way. Indoor-outdoor. For VHF and sub-channels with power feed-through provision; 3.5db insertion loss.

**Blonder-Tongue Model 4SBV 913**

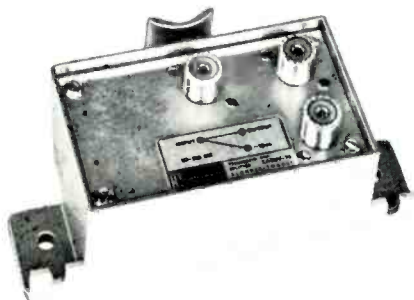
Four-way. Similar to 2SBV but has four outputs and 7.2db insertion loss.

**Blonder-Tongue Model TS774F 914**

Four-way. Indoor. F-type connectors; 6.8db insertion; 20db isolation.

**Blonder-Tongue Model 2ASBV 915**

Two-way. Asymmetrical. Used for tapping off a portion of the signal



from the line while maintaining maximum isolation from the tapped line. Indoor or outdoor mount. Handles 1C to 215 MHz. Available with tap losses of 8, 10 and 12db, with insertion losses of 2db, 1.2db and .8db respectively.

**Channel Master Model 7242 916**

Two-way. F-type connectors supplied. Handles 20 to 890MHz; 3.5db insertion loss.

**Channel Master Model 7244 917**

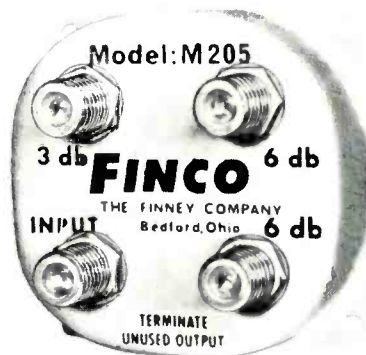
Four-way. Five F-type connectors supplied. Handles 20 to 890MHz; 6.5db insertion loss.

**Finco Model M203 918**

Two-way. VHF only; 3.5db insertion loss; 30db isolation between outputs. F fittings.

**Finco Model M205 919**

Three-way. VHF only; 3.5db insertion loss at one output and 6.5 inser-



tion loss at other two outputs; 28db isolation between outputs. F connectors.

**Finco Model M206 920**

Four-way. VHF only; 6.5db insertion loss; 30db isolation between outputs. F connectors.

**Finco Model M207 921**

Two-way. Outdoor. VHF only; 3.5db insertion loss. F fittings.

**Finco Model M208 922**

Three-way. Outdoor. VHF only; 3.5db insertion loss at one output



and 6.5db insertion loss at other two outputs; 15db isolation between outputs. F fittings.

**Finco Model M209 923**

Four-way. Outdoor; 6.5db insertion loss. VHF only; 12db isolation between outputs. F fittings.

**Finco Model M210 924**

Eight-way. Outdoor. VHF only; 10db insertion loss; 12db isolation between outputs. F fittings.

**Jerrold Model 1562-2 925**

Two-way. VHF only; 4db insertion loss; 15db isolation.

**Jerrold Model 1592 926**

Two-way. VHF only; 3.5db insertion loss; 18db isolation between outputs. F fittings.

**Jerrold Model 1584 927**

Four-way. VHF and sub-channel; 7db insertion loss; 18db isolation. F fittings.

**Jerrold Model SCX-2 928**

Two-way. Outdoor. Frequency

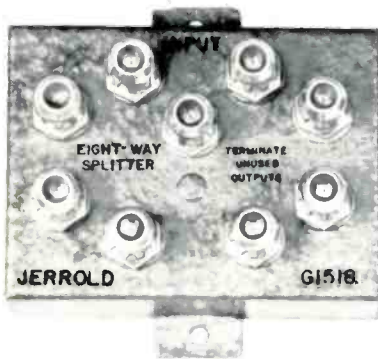


range: 0 to 890MHz; 6db insertion loss; 6db isolation.

**Jerrold Model DC-12UV 929**

Directional frequency: 10 to 890-MHz; 1.75db to 2.5 db insertion loss; 12db isolation. F fittings.

**Jerrold Model G-1518-2 930**  
Eight-way. Indoor. VHF only; 10.5db



insertion loss; 8db isolation. Uses Gamma push-on connectors.

**Jerrold Model 1596 931**  
Two-way. Outdoor. Frequency range: 20 to 890MHz; 4 to 5db insertion loss; 12 to 18db isolation. F fittings.

**JFD Model 8120 932**  
Two-way. Frequency range: 20 to



890MHz; 3.8db to 4.4db insertion loss; 16 to 20db isolation. F fittings.

**JFD Model 8140 933**  
Four-way. Frequency range: 20 to 890MHz; 9db insertion loss; 15db isolation. F fittings.

**Winegard Model LS-275B 934**  
Two-way. Frequency range: 54 to



890MHz; 3.5db insertion loss. Three F connectors supplied.

**Winegard Model LS-475B 935**  
Four-way. Frequency range: 54 to 890MHz; 7.5db insertion loss. Five F connectors supplied.

## Tapoffs

**Finco Models M300 through M304 936**  
Backmatched. Flush mounted. Fit into any ac wall box and can be cov-



ered by standard wall plates. Output connectors include 300Ω screws, F connectors and combinations. Available in 12db, 17db and 23db isolations. For VHF and FM only.

**Blonder-Tongue Versa-Taps 937**  
Blonder-Tongue makes more than 50 types of Versa-Taps. Flush mounted in standard ac outlet boxes and using standard ac wall plates. Available for VHF, FM, UHF or any combination. All Versa-taps are available with 23db, 17db or 12db isolation. Output connectors include



VTF's, solderless auto plugs, 300Ω striplless screws and UHF connectors, Models V-3172, V-3174 and V-3175 are dual gang loop-through outlets

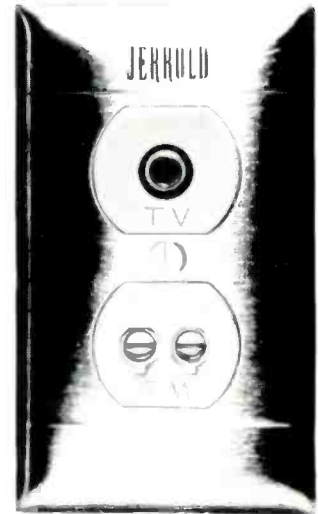
with separate audio connectors. Designed primarily for use with video distribution systems, particularly in ETV applications. Their main function is to provide a loop-through connection for a video camera or monitor. A built-in toggle switch completes the through line connection when the outlets are not in use.

Blonder-Tongue also makes a wide variety of other flush and surface mounted tapoffs.

**Channel Master Models 7213 938 through 7222**

Surface mounted in any ac wall box and covered with any ac wall plate. Available in 12db, 17db and 23db isolation. Output connectors include solderless plugs, 300Ω screws and combinations. Handle 20 to 890MHz.

**Jerrold Ultrataps 939**  
Ultrataps are flush mounted for standard ac boxes and covered with standard ac wall plates. Wide variety



of units available for UHF, VHF, FM or combinations. Output connectors include 300Ω screws, F type and G type.

**Jerrold Variable Taps 940**  
Flush mounted. Complete with wall plates. Each unit includes three isolation values which can be selected by changing the position of a screw. VHF and FM only.

**Jerrold Models 1405, 1406 941 and 1407**

Surface mounted. UHF, VHF and FM. Models 1405 and 1406 are six terminal units (four isolated taps, input and output). Model 1407 is a five-terminal tap for installation at the end of a feeder line.

Jerrold also makes a wide variety of other surface and flush mounted taps.

**JFD Unitaps 942**

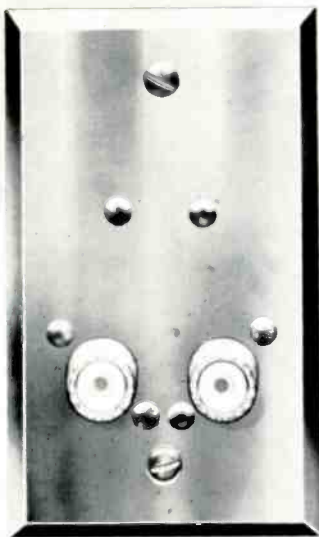
Flush mounted in standard ac outlet boxes with standard ac cover plates. Available with single or dual outputs. All units handle UHF, VHF and FM. Available with 12db, 17db and 23db isolation. Backmatched.

**JFD Positaps 943**

Flush mounted. Include wall plates. Output connectors are 300Ω screws and F connectors. Available with 12db, 17db and 23db isolation. P-5104 includes potentiometer used to vary isolation continuously between 8db and 23db.

**JFD Duo-Taps 944**

Flush mounted with stainless steel plates. UHF, VHF and FM. Dual Teflon SO239A outputs designed for



ETV. Backmatched to accept CCTV camera inputs. Available with 12db, 17db and 23db isolation.

JFD also makes a wide variety of other surface and flush mounted tap-offs, all capable of handling 82 channels.

**Winegard Model UVH-87 945**

Flush mounted. Includes wall plate. F type output connector. UHF and VHF isolation independently variable.

**Winegard Model UVS-87 946**

Similar to UFV-87 but surface mounted.

**Winegard Model VTF-73 947**

Flush mounted. Includes wall plate. Outlet connection is 300Ω with quick disconnect nylon plug. Isolation of UHF and VHF simultaneously variable from 10 to 25db.

**Winegard Model VTF-77 948**

Similar to Model VTF-73 but uses F type output connector. Winegard also makes a variety of other surface and flush mounted tapoffs, most with variable isolation.

**Matching Transformers**



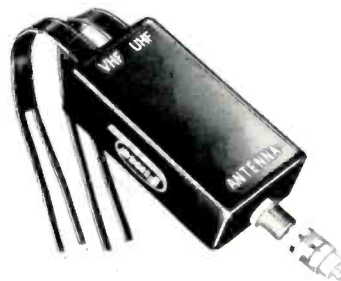
**Blonder-Tongue Model Cable Match F 949**  
Indoor. VHF and FM only.

**Blonder-Tongue Model Cable Match U/V 950**  
Indoor. UHF/VHF & FM. Uses solderless auto plug.

**Channel Master Model 7280 951**  
Indoor. VHF, UHF and FM. Solderless plug 75Ω connector.

**Channel Master Model 7281 952**  
Similar to Model 7280 but used F type 75Ω connector.

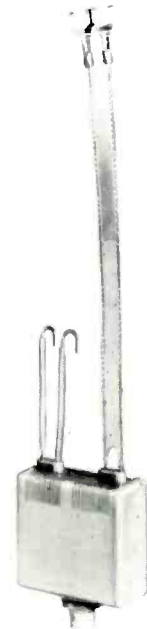
**Finco Model 7520 953**



Indoor. Separate outputs for UHF and VHF. F type input connector.

**Jerrold Model T378 954**  
Indoor. UHF only.

**Jerrold Model FSX-1314 955**  
Indoor. UHF, VHF and FM. Sepa-



rate UHF and VHF outputs. F connector.

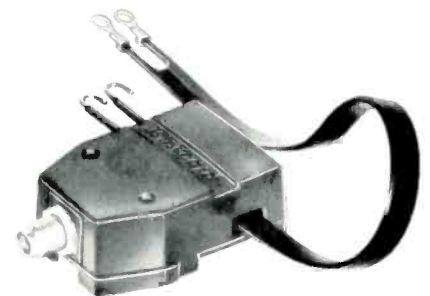
**JFD Model 8310 956**  
Indoor. UHF and VHF and FM. F59 connector supplied.

**JFD Model 8311 957**  
Indoor. Provides separate UHF and VHF outputs. F59 connector supplied.

**Winegard Model ST-75 958**  
Outdoor. VHF only. Mounts on underside of boom with bolt and wingnut. F59 connector supplied.

**Winegard Model T-283M 959**  
Outdoor. UHF, VHF and FM. Mounts on boom or mast. F59 connector supplied.

**Winegard Model CS-175 960**  
Indoor. Provides separate UHF and



VHF outputs. F59 connector supplied.

## DIGITAL TEST INSTRUMENTS

**Digital test instruments are no longer shrouded in a veil of mystery and the coveted possession of a very few. These extremely accurate instruments are now available at prices attractive to even the smallest shop to aid in increasing your service quality and output**

■ We won't go into a long-winded explanation of why a technician needs test instruments, every technician knows he needs them and that they are as important to his business as time itself. Technicians are also aware that the circuits in most of today's electronic equipment are becoming more complex and the test instruments he purchased years ago are in need of re-evaluation. Few technicians today have not heard of the new FET meters, dual-trace scopes and digital test instruments. These are the things that are happening in the test instrument market. They are necessarily more complex, but at the same time, they are easier to operate and more accurate.

Digital test instruments are nothing new, and they are extremely accurate. But until the past few years their cost could not be justified by technicians and shop owners. They were considered as specialized units available only to sophisticated labs in large companies. That image has been changed. The same

advances that have made these sophisticated test instruments necessary, have contributed to their availability at prices even a small shop can afford—especially with the public pressures for faster and better service. Granted, not every one-man shop can, or will, run out and buy an FET meter, a dual-trace scope or a digital frequency counter. But then, maybe he cannot justify the cost of one. However, many shops are re-evaluating their potential and adding instruments designed to meet the challenges of increased service business. Since digital instruments are now being designed within the price range a shop might afford, we felt that a roundup of digital products would be of interest. It does not include all of the digital instruments and manufacturers, but it will give you a fair idea of what is happening in this field. An inquiry number is provided on each instrument which can be circled on the reader service card and mailed if you desire more information.

## FREQUENCY COUNTERS



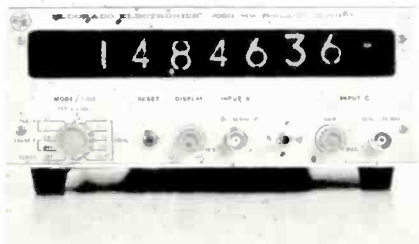
### ATEC Model 2802--\$455

This unit is a modestly priced lab grade frequency counter for general purpose applications. It has frequency, time, totalizing and ratio functions and will count to 12.5MHz. The standard unit has four decimal digits with up to seven digits available as optional units at \$60 each. The entire instrument is solid-state with integrated circuits and modular plug-in design.



### DARCY INDUSTRIES Model 460--\$470

The model 460 is a solid-state digital frequency meter covering a range of 5Hz to 10MHz with an input sensitivity of 100mv to 150v RMS as standard. The unit uses selector push buttons to provide internal time bases of 1, 10, 100ms and 1, 10s. Integrated circuits make up about 90 percent of the instrument which has optional accessories to provide fifth and sixth digits as well as a switch selected 1MHz external oscillator and a 100kHz external time base.



### ELDORADO ELECTRONICS Model 1614--\$1350

The Eldorado model 1614 is a solid-state digital frequency counter that reads to 136MHz with a seven-

digit display and automatically positioned decimal. The instrument also provides period measurements and ratio measurements. The input sensitivity for the dc coupled channel is 100mv; the ac coupled channel has a 250mv input sensitivity. A built-in 1MHz clock is used for measuring 1000 periods of the input and to provide accurate frequency measurement.

There are two input channels, A and C. The "A" channel is the dc input for sine wave signals to 1MHz and from 1MHz to 10MHz. The "C" channel is the ac input for signals from 1MHz to 136MHz.



### ELDORADO ELECTRONICS Model 1505B--\$495

This frequency counter measures from dc to 10MHz and is also solid-state. Besides frequency, it provides period and ratio measurements with readout on the five-digit display. An identical counter with a seven-digit display-- the model 1507B is available for \$595. These two counters have the same input sensitivity to 10MHz as the model 1614, plus automatic decimal positioning and overflow and legend indicators.



### GENERAL RADIO TELEPHONE--\$1050-\$1990

The frequency counters made by General Radio Telephone Co. cover a wide range of frequencies. The CG-3 series is available in a basic unit which counts directly from 10Hz to 10MHz and also generates frequencies from

100kHz to 100MHz. The basic CG-3 sells for \$1050. There are converters to cover the following ranges: FC-2A (10MHz to 100MHz)--\$320; FC-2B (50MHz to 600MHz)--\$620; FC-2C (50MHz to 1000MHz)--\$720; FC-2D (100MHz to 180MHz)--\$385. The CG-3 can be used with any of these to provide the coverage you want.



### SIMPSON ELECTRIC CO. Model 2724--\$450

The Simpson model 2724 frequency counter is a four-digit instrument providing a direct reading from 5Hz to 20MHz. An identical instrument, the model 2725, is available with a fifth digit for \$100 more. Both units provide automatic overrange, period count, totalizing and frequency ratio measurements. Accuracy is indicated to be  $\pm 0.01$  percent  $\pm$  one digit with temperature compensation over a range of  $\pm 15$  degrees centigrade to  $+55$  degrees centigrade.



### SYSTRON DONNER Model 114--\$395

A solid-state instrument, the model 114 reads directly to 12.5MHz with a four-digit readout. Readouts for the fifth and sixth positions are available as accessory units. The counter includes an auto-positioned decimal point, a "kHz" annunciator and storage display. Accuracy is indicated to  $\pm 1$  count  $\pm$  line frequency. As an optional accessory, you can obtain a precision crystal oscillator. The counter circuits consist of PC and IC devices with other solid-state components all mounted on a single board.



## DIGITAL MULTIMETERS



FAIRCHILD INSTRUMENTATION-  
Model 7050--\$349

This low-cost three and one-half digit multimeter measures volts from 1.5 to 1000v full scale and resistance from 1.5K to 15M full scale. The system has a three-digit readout with one overrange digit, decimal point indicator and plus-minus polarity indicators. The instrument operates on the dual slope integrating technique which combines the noise rejection capabilities of integration with accuracy and stability of automatic comparison to an internal standard.



HEWLETT PACKARD MODEL 3430A  
-Digital Voltmeter

The 3430A is a digital voltmeter capable of measuring dc voltages from  $\pm 100\text{mv}$  to  $\pm 1000\text{v}$  full scale with an indicated accuracy of 0.1 percent of reading  $\pm$ one count. It is capable of a 60 percent overrange on all but the 1000v range. Polarity is automatically indicated and a display indicator lights to warn of an overload condition.



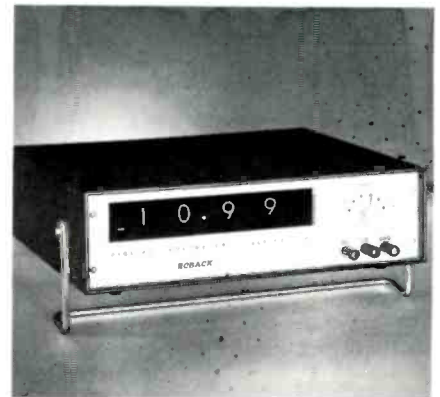
DARCY INDUSTRIES  
Model 330

The model 330 is a digital multimeter featuring push-button control of all ranges and functions. The unit is designed for accuracy in most applications such as voltage checks for general purpose laboratory measurements and radio/TV repair. Reading speed is as fast as 10 readings per second on a four-digit readout with a 20 percent overrange. It will measure dc to  $\pm 1000\text{v}$  full scale in four ranges and current to 10ma. Resistance readings are from  $1\Omega/\text{digit}$  to 10M full scale. Higher current ranges and ac voltage measurement are available as optional accessories.



CALIFORNIA INSTRUMENT CORP.  
(CALICO)  
Series 8300-Digital Multimeter--\$1495  
(complete)

The CALICO 8300 has a five-digit display including overrange with Nixie tubes in the readouts. The basic instrument has a price of \$845 and is designed to accept any of the IC plug-in boards for measuring ac and dc volts, ac and dc current, resistance, frequency and ratio. The complete 8300 multimeter includes all seven functions. Other models are available to provide only specific measurements if desired.



THE ROBACK CORP.-Series 300-  
DVM-\$375

The Roback series 300 digital voltmeter is designed to provide accurate measurement at an economical price. The instrument provides dc

measurements from 100.0mv to 1000v on a three-digit readout with a fourth digit for overrange. Its rated accuracy at full scale is 120 percent. Automatic polarity and indicators are basic features with 100v overload protection on the 100 mv, 1.000v and 10.00v ranges and 1200v on the 100 and 1000v ranges.



TRYMETERICS CORP. - Model 4243--\$850

The Trymetrics model 4243 is a solid-state multimeter with a four-digit readout and automatic polarity indicator. The instrument will measure dc voltage in five ranges, ac voltage in four ranges at frequency of 50HZ to 10KHZ and resistance in five ranges. The instrument is accurate to .01 percent of reading  $\pm$  one digit and has a 10 percent overscale readout. One of the unique features of the system is a power line sync circuit to enhance rejection of line frequency noise.



SIMPSON ELECTRIC CO - Model 2701--\$835

The Simpson 2701 digital VOM provides a three-digit readout of ac and dc voltages in six ranges, ac and dc current in nine ranges and resistance in seven ranges. Ease of operation is assured by pressing a button and reading the measured input, complete with polarity sign and decimal point. The instrument comes complete with test leads and manual.

## COMBINATION SYSTEMS



**EAI 6201-Digital Voltmeter Module--\$250**

The EIA 6201 digital voltmeter module plugs into the EIA 6200 display unit to provide dc voltage ranges from 100mv to 1000mv with an accuracy of  $\pm 0.1$  percent  $\pm$  one digit. A high input impedance reduces circuit loading. The unit features automatic polarity selection and push-button ranging for fast operation. Overload protection to 1000v is provided on all ranges and on overrange capability of 40 percent of all except the 1000v range.

**EAI 6202-Digital Counter Module--\$275**

The counter module, when used with the 6200 display unit, performs all general purpose counting functions including accurate measurement of frequency, time intervals and periods. Frequency measurement is from 0 to 10MHz with an accuracy of  $\pm 0.005$  percent  $\pm$  one count. Input impedance is 1M, sensitivity is 100mv RMS. The instrument uses silicon, high-speed logic circuits and has an internal crystal controlled oscillator with integrated circuit countdown time base to insure stability.



### EAI 6203-AC Converter Module--\$250

The ac converter module provides voltage measurements in four ranges to 300v (RMS) over a frequency range of 20Hz to 100kHz when used with the dc integrating digital voltmeter module. The 6203 produces a dc output voltage proportional to the RMS value of the sinewave voltage being measured. The dc output is digitized and presented as a four-place decimal display on the 6200 unit.



### EAI 6204-Current/Resistance Module--\$295

This module is used with the basic 6200 to provide multifunction measurement capabilities. When used with the dc voltmeter module, it will read dc current from 100  $\mu$ a to 1000ma and resistance ranges from 10.00  $\Omega$  to 100.0M (full scale). It can also be used to measure resistance in circuits using solid-state devices. The voltage applied to components being measured is held to a 100mv maximum to protect any sensitive units from damage.

### ELECTRONIC ASSOCIATES, INC. 6200 Series

### EAI Series 6200-Digital Display Unit--\$340

This instrument provides the basic measuring system consisting of a digital display unit for use with accessory plug-in modules to read dc and ac measurements. The basic 6200 has a four-digit readout—three full range plus one for overrange with an automatically positioned decimal and variable display time.

### HICKOK DP100-DC Voltmeter Plug-in--\$175

This plug-in is used with the DMS 3200 series main frame to provide

digital display of voltages from 100mv to 1000v. It is an integrating type voltmeter with an accuracy of  $\pm 0.1$  percent of the reading  $\pm$  one digit on all ranges and a high input impedance. The DP100 uses a photo-chopper stabilized voltage-to-frequency converter with a precision gate to provide true integration for good noise rejection. The dc voltmeter operates on five ranges with no loss in accuracy up to 60 percent overrange. Test leads and a low capacity probe are available as accessories.

### HICKOK DP110-DC Microvoltmeter Plug-in--\$450

The microvoltmeter module provides a digital display of dc voltages as low as 1  $\mu$ v up to 1000v with an accuracy of  $\pm 0.05$  percent of reading  $\pm$  one digit when used with the DMS 3200 series main frame. It is an integrating type unit with a floating input circuit and more than 10,000M isolation between input ground and chassis or power line ground.

The DP110 also features an automatic polarity circuit with display on all ranges and a 1300 percent overrange. Test leads and a low capacity probe are available as accessories.

### HICKOK DP 130-AC Voltmeter Plug-in--\$375

The ac voltmeter plug-in provides a digital display of ac values from 10  $\mu$ v to 1000v in six ranges. Accuracy specifications are indicated to be  $\pm 0.1$  percent of the reading  $\pm$  one digit on all ranges includes effects of normal ambient temperature changes, line voltage fluctuations and line frequencies from 47Hz to 400Hz. A high input impedance of 1000 megohms, used on all ranges, and input circuit protection with a built-in noise filter, are standard features on this instrument.

### HICKOK DP 160-80MHz Counter Plug-in--\$395

The 80MHz counter plug-in is a direct reading instrument from 0.1Hz to 80MHz. When used with the DMS 3200A or 3200P Main Frame, the range is extended to 100MHz. The counter includes overrange capabilities that allow the normal three-digit display of the Main Frame to provide up to seven-digit resolution with an accuracy of  $\pm 0.00005$  percent of reading  $\pm$  one digit. This makes it usable for measurements of communication frequencies in addition to normal counter applications. One of the noteworthy features of this instrument is its 20mv sensitivity rating.



### HICKOK—DMS 3200 DIGITAL MEASURING SYSTEM--\$375

The Hickok measuring system provides a digital display of the measured values from one of several available plug-in modules. The DMS 3200 is the "Main Frame" of the system which is all solid-state using a three digit Nixie tube readout. It contains a power supply and all the necessary operating voltages for any of the plug-in units. All initial voltages are zener regulated and designed to operate from 117 or 220vac at 47 to 400Hz. Both sides of the ac power line are fused. There are two models of the DMS 3200 now available: DMS 3200A and DMS 3200P. The 3200A is as described. The 3200P, which sells for \$450, has buffer-storage circuitry and printer output capabilities in addition to the features of the DMS 3200A.

# Repairing Solid-State Radios

These troubleshooting methods and case histories may be

■ Repairing the tractor radio has become additional business for the radio-TV technician. The older tractor radio models contained tubes and vibrators, but today they have progressed to solid-state. The transistorized tractor radio is a high gain auto radio with protective wind and dust features. Practically all tractor radios are now transistorized units.

## Circuit Description

A typical transistor tractor radio schematic is shown in Fig. 1. The antenna dipole is coupled through an RF choke to the RF input coil. Transistor TR1 is an RF amplifier and TR2 is a mixer-oscillator stage. The permeability coil tuner varies the inductance of the RF, mixer and oscillator stages.

There are two stages of IF amplification with a second detector employing a fixed crystal diode. A treble and bass switch simply adds or removes a .1 $\mu$ f capacitor across the volume control. A transistor interstage amplifier is capacitor coupled to the driver stage. The audio signal is then transformer coupled to two power transistors in a push-pull operation. The 6 by 9 in. weather coned speak-

er is connected directly to the output transformer primary. The speaker voice coil impedance is 10 $\Omega$ .

## Common Troubles

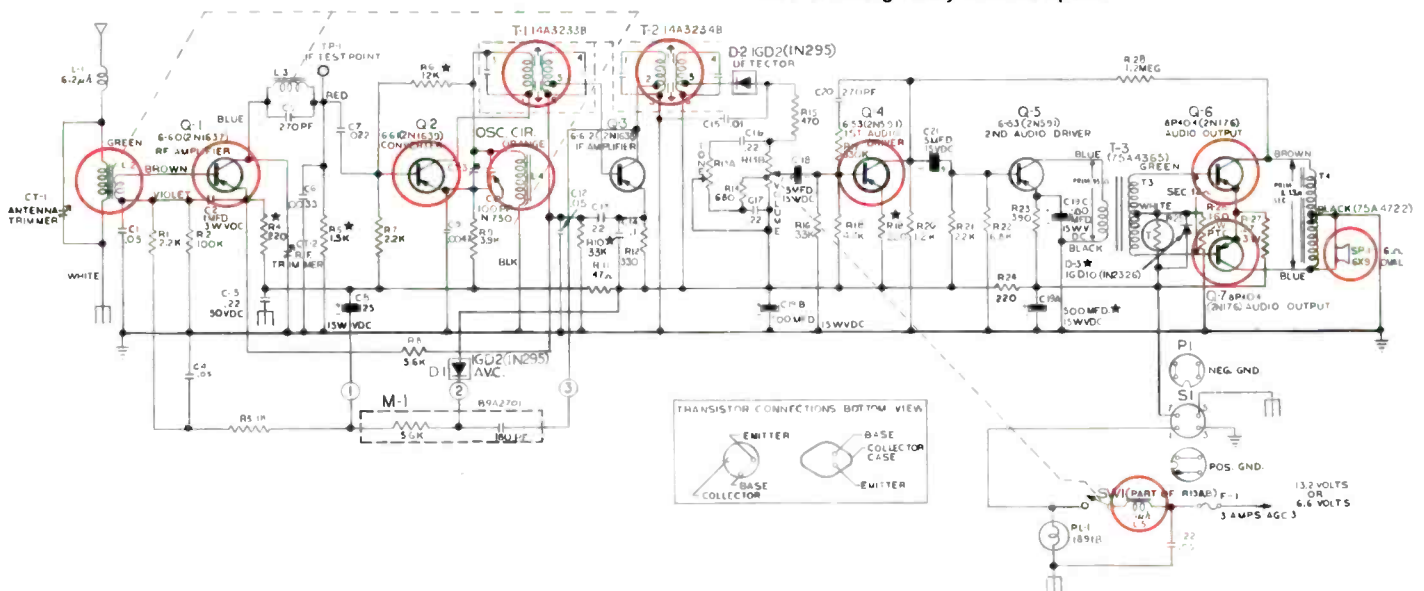
When repairing the tractor radio, look for signs of troubles caused by vibration. Practically all troubles are results of vibration, noise and dust. To overcome the tractor noise, the best PM speaker can be over-driven. It is impossible to keep dust or dirt out of the tractor radio, but many radios have a dust-proof lid that will close tightly when not in use.

The parts that cause most of the troubles are a broken "A" lead, power output transistors and speakers. See Fig. 2. If there is no sound and the pilot light is on, check the PM speaker.

Cone voice coil leads can be torn out by running the radio at the top volume to overcome noise and a loose or grounded voice coil lead can cause intermittent reception. Distorted sound can be caused by an off-center voice coil rubbing against the center magnet pole. To correct this condition, either re-cone or change speaker with the correct voice coil impedance and a heavy speaker cone.

If only a hum or click comes from the radio speak-

Fig. 1--Schematic of a typical tractor radio showing likely trouble spots.



## helpful in solving 'tough dog' problems

er when first turned on, one or both power output transistors may be at fault. A loud hum is caused by a shorted output transistor and can quickly be located with the power supply ammeter. When replacing the power output transistors, clean, replace insulated washer and apply a coat of silicone grease. Be sure to check the bias and emitter resistors for burnt spots. A small change in resistance will result in distorted output.

If you hear a hum or click when the switch is turned on, you know the speaker has continuity. If the pilot light doesn't function, go to the "A" lead choke coil and check for broken leads. A faulty on/off switch can cause the same trouble. Check for correct radio polarity. A battery polarity plug is used on most tractor radios and may be in the wrong position.

If TR6 or TR7, power output transistors, short out, generally the output transformer T4 will become quite warm. This condition will create a loud hum, no volume and dimming of the pilot light. For quick troubleshooting, take a resistance measurement between collector to emitter and compare this resistance against the other power transistor. Remove the shorted or lowest resistant reading transistor and check the insulator for breaks or insert a new one. Replace the transistor and make sure the two mounting screws are tight. You can check resistance polarity of the transistors by using the method shown in Fig. 3.

Another method is to check all of the transistors with a transistor tester. An in-circuit Beta transistor checker will eliminate possible defective transistors and speed your servicing time. On difficult tractor radio troubles, check all transistors. This is the same system used in checking a tube radio and the transistors do not have to be removed from the PC board with an in-circuit transistor checker.

### Weak Sound

Most tractor radios have a single dipole mounted on the case or on a bracket. The tractor radio antenna is quite large and high. Vibration, wind and objects striking the antenna dipole will bend and loosen the joints. If the sections of the telescoping antenna will not pull out or stay in a set position, simply drill a hole and insert a bolt and

nut. Generally, the tractor radio antenna is fully extended.

A broken antenna wire, bad RF coil, and first RF transistor will produce weak sound. Check for broken or loose wires around the antenna trimmer capacitor and tuner assembly. If the front end of the receiver is weak, the hissing or RF noise is not present. Weak sound can also be caused by a weak or defective TR4 and TR5 transistor. Coupling capacitors with loose ends can also cause weak reception.

To isolate problems in the RF or IF portion or the audio section, simply touch the volume control with a sharp pointed screwdriver or inject a signal from the noise generator. If you get plenty of audio hum, the trouble is in the front end of the receiver.

If there are no loose or broken wires to the coils, check the resistance of each coil with an ohmmeter. Generally, the wires going to the small coils break off at the soldered joints. If you don't have results, pull the coil from the metal shield and find the broken end. Most coils can be repaired, although if the whole tuner assembly has been damaged, replace the assembly.

Fig. 2--The choke coil "A" lead is quite often broken by vibration and should be resoldered, then cemented in place with a rubber silicone cement.



If there is a loud hissing noise but no stations, touch the antenna dipole with a screwdriver to see if the noise becomes louder. If there are still no stations, rotate the tuner through the complete band. If stations come in on the high end of the band but fall off in the lower portion, replace oscillator transistor TR2. Also, a broken lead from the oscillator coil section to the oscillator transistor will produce the same results.

Then if you are only receiving two local stations, check transistor TR1. This transistor will short, causing weak reception. Also, check the antenna coil and antenna dipole lead-in. Weak IF transistors or transformers will cause the radio to receive only local radio stations.

Intermittent troubles are generally caused by transistors, coupling capacitors and IF transformers. Try to isolate the intermittent trouble as close as possible. Push and pulling on the IF transformer lugs and PC boards will produce intermittent results.

### Other Troubles

If there is no change in the tone of the radio when the treble and bass controls are varied, check the switch contact. Spray a little tuner lube into the switch assembly. The treble and bass control adds a .1 $\mu$ f capacitor to the audio circuit when switched to the bass position.

For loud hum, check the electrolytic capacitor pack with the capacitor checker or substitution method. If it is defective, install a new filter pack. Small electrolytic coupling capacitors can dry out and cause weak volume.

If you suspect transistor TR4 or TR5 of being defective, simply short across collector to base. If the transistor is bad, the volume will be low, but you will at least have some output. You will then know the transistor should be replaced.

### Alignment Procedures

When the IF transformer or RF coil is replaced, complete receiver alignment may be necessary. First, connect a dummy antenna in series with the output lead on the signal generator. Connect the ground lead of the generator to the chassis of the radio.

Set the receiver dial to the extreme high end at 1600kHz. With the generator set at 265kHz adjust the 2nd IF transformer T2 top and bottom. All adjustments are for maximum volume. Then, adjust the 1st IF transformer T1 top and bottom. Then set the generator to 1600kHz and adjust CT-3. Tune in a signal at 1400kHz and adjust CT-1 and CT-2. After the chassis has been installed, adjust CT-1 on a weak station for maximum volume near 1400kHz. The antenna should be extended to its operating height.

### Intermittent Automatic

A 1966 Automatic tractor radio had intermit-

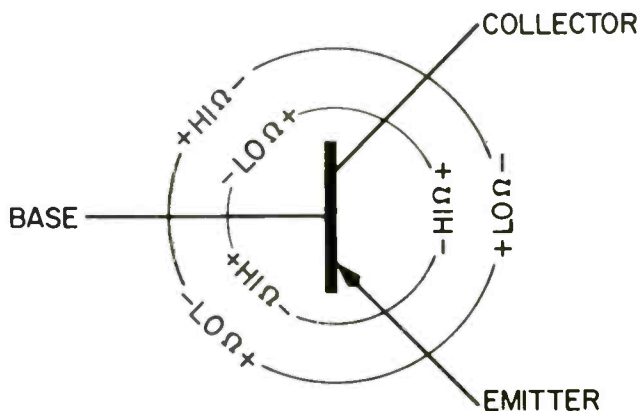
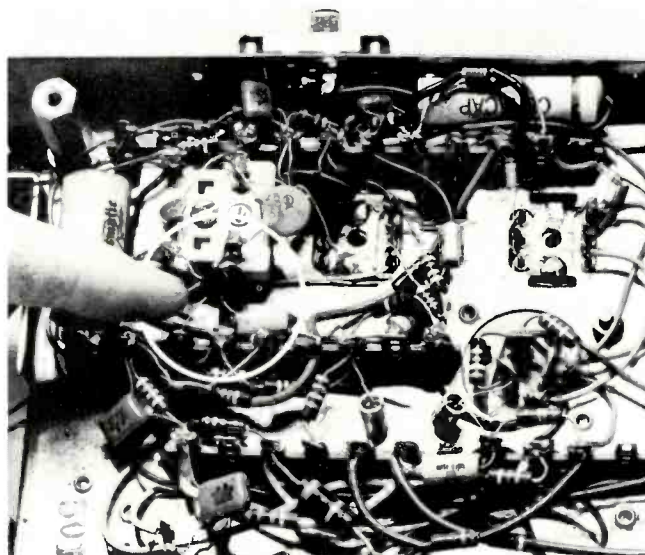


Fig. 3--Checking the PNP transistor by the resistance method.



The oscillator transistor is replaced with a general purpose transistor.

tent sound. The audio signal was good from the volume control to speaker output when driven with a noise injector signal generator. The intermittent trouble was isolated to the RF and IF section.

The signal would drop and then raise on distant stations. All local stations were fairly good. The trouble was then isolated to the output of the first IF stage. A 270pf capacitor C4, was intermittent. By placing the soldering iron alongside this defective capacitor, it would become intermittent.

In several of the later Automatic tractor radios the IF assembly, which is mounted separately, has a tendency to become intermittent. This can be caused by excessive tractor vibration--resistors, capacitors and tie wires connected to this IF assembly break off. Sometimes this assembly has to be twisted from side to side to find the actual broken connection.

### Dead Radio

If the radio pilot light does not come on, or if there is no output from the speaker, check for a

*(Continued on page 88)*



# Education and Inventory

■Samual Dunbar, president of Clark Dunbar, Inc., believes in customer education. "The customer must be told what to expect in color TV reception, particularly fringe area and cable TV system viewers," he states.

Dunbar estimates that 25 percent of TV calls can be placed in the nuisance category: the set works fine, but the received signal is not up to par or the set owner has become a knob twister.

A complaint many shops receive, especially from customers living some distance from a TV station, is that of poor color. Poor color can mean a number of things. A customer must be taught that color reception and transmission are more critical in terms of signal levels than B/W. A little education on the whys and wheres of color levels can do much to dispell latter claims of poor set operation.

Practical explanation and demonstration of operating controls are a must. A customer should be told that each time he switches to a different channel he may have to make minor adjustments of the fine tuning, color level and tint controls. These are operator controls, just as they are on B/W sets.

Clark Dunbar realizes that many new color TV owners are not orientated to operating a color set and this lack of proper training can lead to dissatisfaction.

Dunbar explains "Our customers are given a thorough

demonstration. All the showroom color sets are connected to a master antenna system, as well as the local cable system. The customers can view color programming on either one, depending on which system he has in his area.

"All of the sets are pre-tuned before they leave the store. In addition, the customer can use the set in his own home on his own antenna system for one week's free trial—our return rate with this procedure is very small.

"We feel confident in our merchandise and service because of our business relationship with the manufacturer. When we demonstrate a set, the customer knows we will keep it operating properly." That is why Dunbar feels that local discounters

are not hurting his sales. "A discounter cannot service electronic merchandise properly at the profits involved. We don't make a profit on service. It's a necessary backup for sales. Therefore, operation on a break-even basis is acceptable."

## Stock Control System

Robert Goodman, the shop's service manager, like many technicians does not appreciate having sets around waiting for parts. "It's almost impossible to stock all the parts we might need," Goodman admits, "but we eliminate a lot of the repair problems by keeping an adequate replacement parts inventory. We use a card control system to maintain the right quantity and type of part.

"Our inventory records list



Samual Dunbar and John Miller check stock control cards prior to ordering new color receivers.

Dispatcher checks card file and relays history of customer's TV set to technicians on house calls in radio-equipped vans.



the model stock on each file card to show the maximum stock and the re-order point. The cards are then filed alphabetically and numerically. As a part is used, it is noted on the card.

"In this way we have a running account of the usage rate. It helps spot areas of rapid parts turnover and we can stock up accordingly. The same holds true for the seldom used items so we don't end up with obsolete parts."

Clark-Dunbar also utilizes the same filing system on large items such as TVs, radios and stereos. When an item is received at the warehouse, a receiving report is made and checked against the invoice number. The invoice number is put on a stock control card and shows receiving date, model number and quantity of units received. The actual cost of the unit and shipping charges are also noted.

Later, when the set is sold, the card is marked with the date of sale, the customer's name, the store's billing invoice number and the serial number of the merchandise.

Dunbar states, "It's a great way to check on warranty and parts used for service. This type of inventory control is essential to an electronics business and our future plans call for expanding this control to computer processing. It will give us our actual operational costs and inventory on a monthly basis."

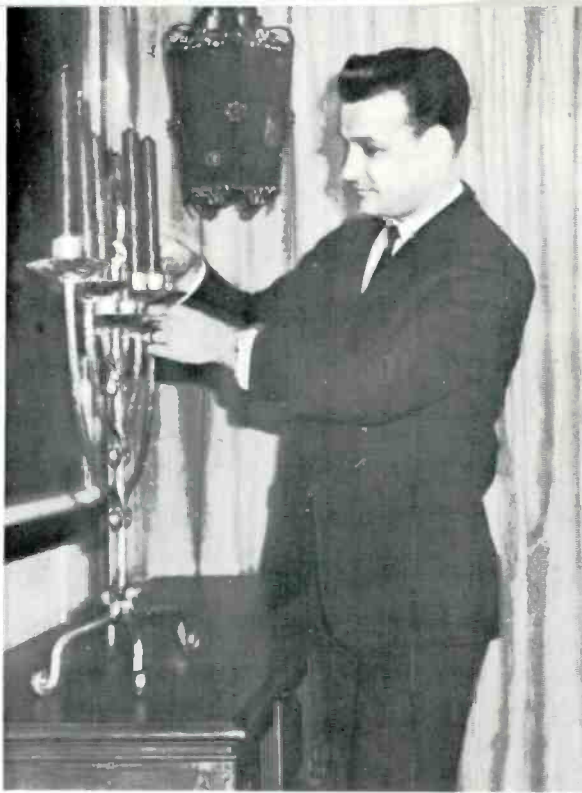


Recently remodeled exterior of Clark-Dunbar, Inc., in downtown New Orleans.

Window displays are arranged to simulate the relaxed atmosphere of the home.







John Edwards, one of Clark-Dunbar's sales team, is also a qualified interior designer and assists the prospective buyer in selecting the appropriate cabinet style to match the decor of his home.



One of the service technicians performs a final check on a color chassis before re-installation.

**ET/D**

## TEST LAB REPORT

Knowing your test instrument is the only way to take advantage of its time-saving capabilities. If you install antenna systems or service color TV, it will pay you to become more familiar with the versatile test instruments presented in this month's Test Lab Report.

**Jerrold**

**AIM-718**

**Signal**

**Strength**

**Meter**



Jerrold AIM-718 VHF-UHF antenna installer's meter.

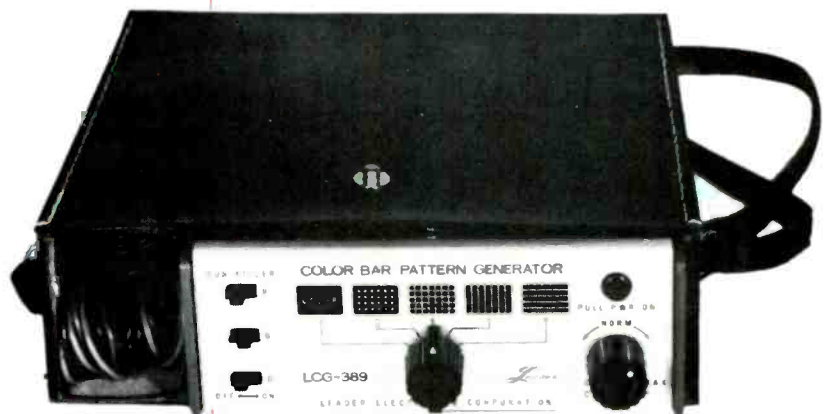
**Leader**

**LCG-389**

**Color Bar**

**Pattern**

**Generator**



Leader Model LCG-389 color bar pattern generator.

■The Jerrold AIM-718 Signal Strength Meter (SSM) is actually a sensitive, tunable receiver for VHF and UHF. The receiver has a frequency range of 54 to 216MHz for VHF TV-FM and 470 to 890MHz for UHF-TV.

The instrument is completely portable using four readily available 9v transistor batteries. The receiver has two calibrated vernier tuning dials, one for VHF, one for UHF. Each of these ranges has its own antenna input terminals for use with 300 $\Omega$  line. A handy matching transformer included with the instrument is provided for systems using 75 $\Omega$  coax.

The large meter scale gives the value of the incoming signal which is read directly in microvolts or dbmv. A separate attenuator switch is provided for VHF and UHF. The VHF input can have as much as 20db of attenuation through two 10db switches. There is a single 10db attenuation switch for UHF. The sensitivity of the receiver at 75 $\Omega$  is 20 $\mu$ V and 40 $\mu$ V at 300 $\Omega$ .

The instrument is very easy to operate. A control on the front panel pulls up to turn the unit on and sets the audio level to a crystal earphone which is supplied to plug into the phone jack. The audio level is kept fairly low, but loud enough to hear the signal clearly in the earphone. A unique safety feature on the leather carrying case automatically turns the unit off when you close the cover.

To operate the SSM, pull the on-off switch portion of the Battery Control Knob up. This turns the unit on. Move the VHF-UHF switch to the SET Battery position and calibrate the meter dial to the battery indicator line using the BATTERY CON-

TROL KNOB. Now simply connect the lead-in to the proper terminals and tune in the desired signal. If the needle swings full scale, switch in the attenuators. A handy reference chart mounted in the SSM carrying case cover indicates the meter scale values with and without the use of attenuation. Once the meter is calibrated, the values are read directly according to the attenuator charts.

The VHF tuning dial is large and indicates the TV channels as well as the FM portion of the frequency range. The UHF dial is marked off by channel number.

You can use an SSM to check any antenna system within the frequency range of the unit. Among its other advantages, the SSM will isolate signal losses due to poor lead-in or connectors, it is ideal for tuning antennas and for adjusting antenna direction for maximum signal.

The Jerrold AIM-718 is small, light and easy to operate, but some of the things we felt would make it even easier to use would be more audio with a built-in speaker (even if it is a small one) and a selector to choose between speaker and earphone. However, except in high noise areas, we doubt that the earphone would be used. The idea of having audio is great, but using an earphone seems a bit unhandy. Also, we would like to see the circuit operate on one common transistor battery voltage if possible. Having to replace four batteries instead of one could be a nuisance at times.

The entire unit, weighing just over 4 lb, comes in a rugged leather case with a carrying strap, matching transformer, high impedance earphone, instructions and a type "F" plug for RG59/U cable and sells for less than \$200.

The weight and compact size of this instrument was the feature noticed first. The generator weighs 3 lb and comes in a handy carrying case which does not have to be removed when put in service.

We were impressed with the stability of the unit after trying it on a number of patterns. The internal logic circuitry of the instrument is made up of binary counters (flipflops) and logic gates for the formation of the highly stable signals for the patterns. According to the manufacturer, this is why there is no need for temperature compensation in the frequency dividers or the preliminary checking and adjustments usually required in the conventional generators.

A regulated power supply is another feature included to eliminate the effects of changes in the line voltage.

Although the unit may not have all the patterns of the bigger, higher-priced units, it generates the five basic patterns most used in the servicing of color and monochrome TV receivers. RF output is provided for either five or six by a slide switch

on the back of the unit near the RS output socket.

The generator is provided with three gun killer switches and leads for cutting out the Red, Blue and Green guns of the CRT and each lead is equipped with a 100K fixed series resistor.

The operation of this generator is similar to other generators. The 300 $\Omega$  feeder lead from the generator is connected to the antenna terminals of the TV. Then the channel selector is set to channel five or six. If both channels are used locally, set the selector to the channel with the minimum interference.

If the pattern is not steady or blurred, check the following: (a) feeder connections between the generator and the receiver input, (b) proper matching of the test channel, (c) fine tuning adjustment in the tuner, (d) interference from noises or broadcast signals, (e) proper adjustments in the horizontal and vertical sync hold in the receiver; (f) if the pattern tends to "run," set the ALFC (automatic local oscillator frequency control) to off and use the manual control; (g) the brightness

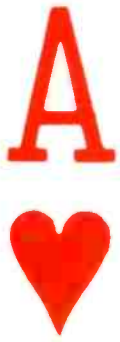
## TEST LAB . . .

and contrast should be adjusted (lowered) to prevent defocussing in the CRT; (h) in certain types of receivers, it may be necessary to reduce the contrast since the vertical lines tend to be a little darker than the horizontal lines--this effect is caused by the narrower response and the higher frequency components being attenuated; (i) in color receiver, when the dots or the horizontal lines are tinged with color, adjust the color killer control to remove the effect; (j) if the patterns are not displayed, check the receiver.■

### SPECIFICATIONS.

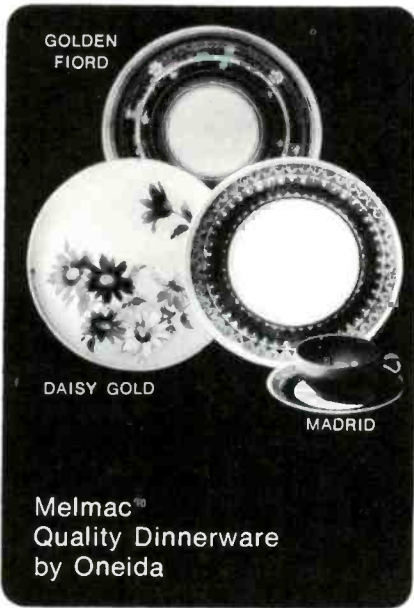
1. Patterns:
  - A. Color Bars Gated rainbow, ten bars of the offset color subcarrier type. Color burst frequency: 3.563795MHz, within  $\pm 200$ Hz. Chroma level adjustable from 0 to 200% of the sync signal.
  - B. Dots At intersections of the crosshatch.
  - C. Crosshatch Square figures: 21 vertical and 15 horizontal lines.
  - D. Vertical 21 lines.
  - E. Horizontal 15 lines.
2. RF Output:
  - A. Channels TV 5 (77.25MHz) and TV 6 (83.25MHz) within  $\pm 0.5\%$ .
  - B. Output 10mv approx. on open circuit; impedance, 300 $\Omega$ , balanced.
3. Sync Signals (1H = 63.5 $\mu$ s):
  - A. Horizontal 15.75kHz; pulse width, 0.083H.
  - B. Vertical 60.11; pulse width, 3H.
4. Return Trace Blanking:

	Interval	Front Porch
A. Horizontal	0.17H	0.02H
B. Vertical	22H	3H
5. Gun Killers For Red, Blue and Green, grounded through 100 $\Omega$ .
6. Power Supply 105-125v, 50/60Hz; 2VA approx.
7. Size and Weight 2 1/2(H) x 6(w) x 8(D)in.; 3 lb, approx.

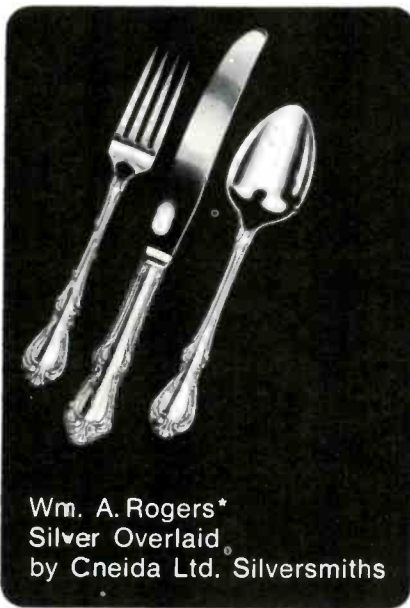


# DEALER'S CHOICE

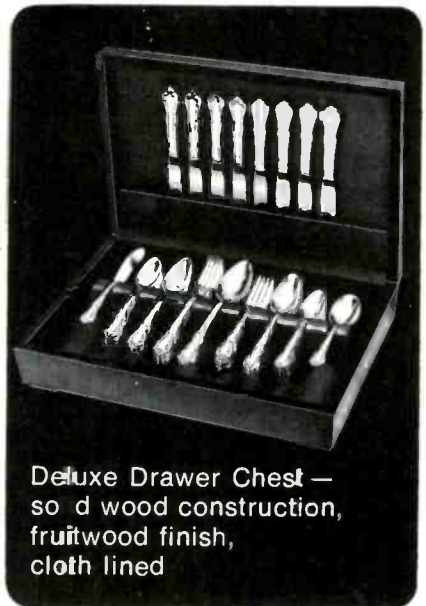
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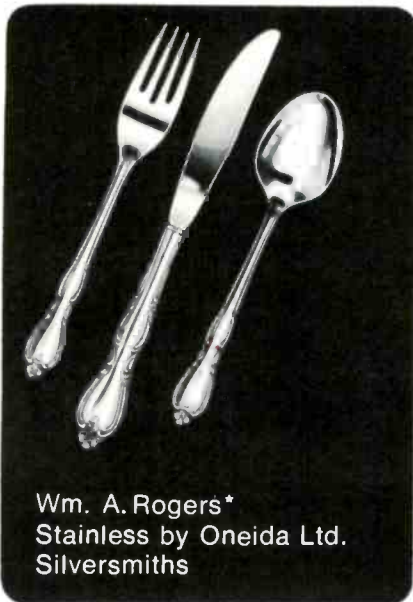
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GENERAL  ELECTRIC



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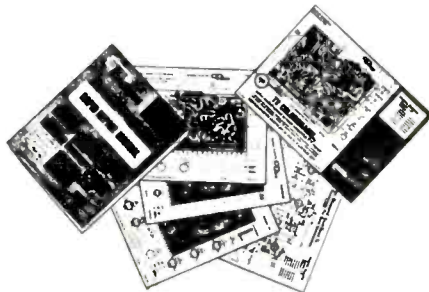
If you've heard about TV Colorgrams, then you know they were a real bargain at their original total price of \$102.50. Now, at this special price of only \$19.95, they're almost a steal.

## What are TV COLORGRAMS?

They're amazing new color-coded charts that help you isolate TV receiver difficulties and with less effort than you ever dreamed possible. Each COLORGRAM chart is clearly color-coded to show signal-flow, continuity, test points, and voltages. The entire ground conductor is shown in its own distinctive color. Every component in the circuit is clearly identified, and its relationship to other components made readily recognizable. COLORGRAM charts let you concentrate on that small portion of the set most likely to be the cause of the trouble. There's no time wasted working back and forth between schematic and set looking for tests points . . . wading through superfluous information . . . identifying components incorrectly. With COLORGRAMS, everything is there, before your eyes, and very often looking just as it does in the set.

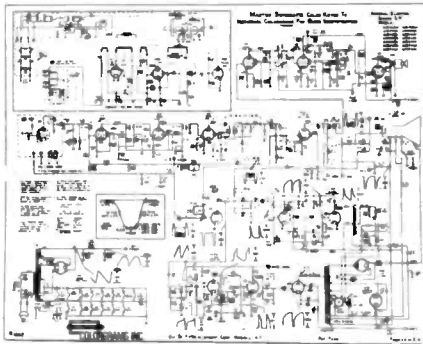
## What does a TV COLORGRAM Service-Pak include?

Everything you need to service a whole series of TV sets!



Typical COLORGRAMS SERVICE-PAK sold for \$1.95. You get 50 such PAKS . . . plus 148-page Index . . . for only \$19.95!

First of all, the Pak includes COLORGRAM charts for IF, Video, Audio, Vertical and Horizontal (showing sync and sweep circuits), B+ distribution and AGC circuits. You use the Video chart if you have a Video problem, the Audio chart if you have an Audio problem, etc.



Easy to read complete master schematic is color-keyed to the colors used in the Colorgram Charts.

Second, the Pak includes color-keyed master schematic providing an overall view of the receiver circuit. It shows the Tuner, IF, Video, Audio, Vertical and Horizontal sections, color-keyed to the colors used in individual COLORGRAM charts. It also shows test points, waveforms, voltage, resistance, capacitance, practical alignment data, etc.

## CONTENTS

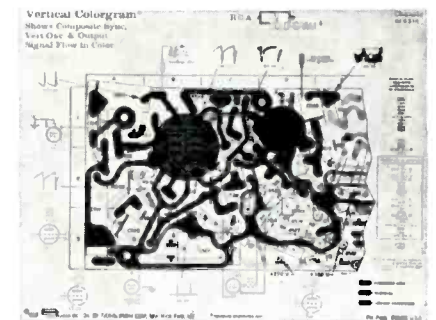
ADMIRAL (25 CHASSIS, 179 MODELS)  
EMERSON (24 CHASSIS, 100 MODELS)  
G. E. (9 CHASSIS, 332 MODELS)  
MAGNAVOX (1 CHASSIS, 27 MODELS)  
MOTOROLA (8 CHASSIS, 63 MODELS)  
PHILCO (24 CHASSIS, 122 MODELS)  
R. C. A. (125 CHASSIS, 539 MODELS)  
WSTGHSE. (27 CHASSIS, 183 MODELS)

Third, the Pak includes a Rapid Repair Manual that is an effective guide to the use of the COLORGRAM System. It contains original manufacturer's service notes, special instructions, circuit modifications, parts list, and parts numbers. Other practical service data in the Guide are a Pictorial Tube and Component Location Chart, and a Tube Failure Guide.

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we'll include the 148-page MASTER-INDEX and Cross Reference Replacement Parts Guide which lists all 1500 TV sets you can quickly repair with TV COLORGRAMS. It describes the black-and-white receivers of Admiral, Emerson, General Electric, Magnavox, Motorola, Philco, RCA, and Westinghouse. These receivers are cross-referenced (by IBM data-processing) to nine replacement parts manufacturers . . . Aerovox, Centralab, Clarostat, G. C., Merit, Stancor, Thordarson, Triad, and TVD, covering over 25,000 parts listings. This INDEX gives you the newest, fastest, clear-



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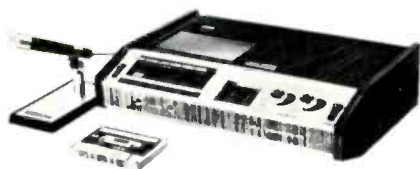


# DEALER SHOWCASE

For additional information on products described in this section, circle the numbers on Reader Service Card. Requests will be handled promptly

## Stereo Tape Deck 700

Announced is the introduction of the professional model CAD4 stereo cassette tape deck. Reportedly the high frequency response of the tape deck is beyond 12kHz with low noise and distortion. The recorder offers many features which have been designed for quality recording and playback. Two large, illuminated VU meters are lo-



cated on the sloped front panel where they can be easily monitored. A recording overload indicator light is keyed to the VU's and triggers at +2VU to show when a tape recording is being overmodulated. The tape deck also features automatic shutoff at the end of the tape, push-button operation, stereo microphone inputs, dual recording level controls, tape footage counter, motor and recording indicator lights. Enclosure is constructed of heavy-gauge steel encased in walnut end caps. Resale price \$159.50. Harmon-Kardon.

## Speakers 701

A ten-model speaker line, aimed at both the original equipment and replacement markets, is introduced. Labeled the "Acousti-Perfect" line, it offers a selection of three extended-range high-fidelity speakers in 4, 5 1/4 and 6 1/2 in sizes, all powered by a

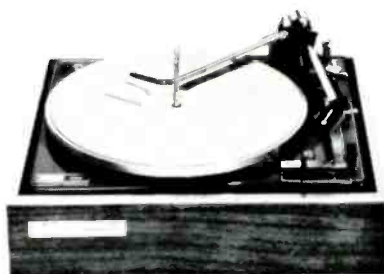


9oz ceramic magnet. To complement the smaller size, the new line provides two full-range co-axial speakers in 12 and 15in diameters with special heavy-duty 34oz ceramic magnets. For the bass response, the speaker line provides three popularly sized woofers to meet all product needs. All units feature an 8Ω voice coil, available in an 8in model with a 9oz cera-

mic magnet, and in the 12 and 15in sizer powered by a 34oz ceramic magnet. Two heavy-duty musical instrument speakers round out the present line. Designed to meet the power requirements of today's users, they feature 3in voice coils and 42oz Alnico V magnets. All models in the new line are finished in a distinctive, long-wearing purple acrylic paint. Oxford.

## Automatic Turntable 702

Announced is a deluxe model turntable with the latest design features. Made in England, the model 929 four-speed turntable and record changer permits fully automatic, semi-automatic or manual operation of stereo and monophonic records. It may be set for continuous repeat-play or automatic shutoff. Speeds are 16 2/3, 33 1/3, 45 and 78 rpm. It features pause and cueing control. The tone arm may be lifted off



a record in play and then lowered into the same groove. A low-mass tubular tone arm is counter-balanced on nearly frictionless ball bearings for accurate tracking. Other features: Stylus pressure adjustment (0-6g); automatic lock to secure arm in "off" position; adjustable antiskate control to prevent unequal pressure on stylus; dynamically balanced, resiliently mounted four-pole motor that helps to reduce wow, which is claimed to be less than 0.12rms, and flutter to less than 0.05% rms at 33 1/3rpm; pop filter and muting switch; shockproof suspension of heavy-cast, perfectly balanced 11in. turntable; clip-in cartridge holder for quick cartridge changing. The size of the automatic turntable is 13 1/8 x 11 1/4 in. Price \$69.96. Allied.

## Record Cleaning and Maintenance Kit 703

Announced is a record cleaning and maintenance kit designed for use on

new records or records in new condition to be played with cartridges requiring very low tracking pressures of 2g or less. The nylon bristles of the brush are ground down as nearly as possible to infinity. This density pro-



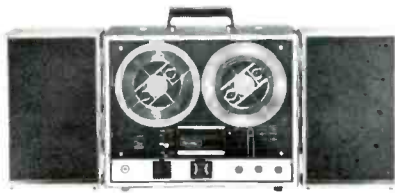
vides the necessary degree of resistance and "springiness" or resilience. With a pressure of about 2lb applied to the brush, which is the approximate force required to flex the bristles slightly, the pressure of each individual bristle on the surface of the disc is about 1/10g. With the pointing angles used, the natural resilience of the nylon and the large number of bristles reportedly produce countless oscillations as the twists and turns of the record groove are followed. This lets the brush thoroughly and completely clean right down to the bottom of the groove in the minute high frequency waveforms so all foreign matter is removed. The key to the control of static is the attainment of the correct level of humidity at the working surface at the time of playing and cleaning. This is reportedly ensured by the maintenance of a humid atmosphere within the case and activation immediately before use. Price is \$15. Watts.

## Stereo Recorder 704

Introduced is the model 2408 solid-state stereo tape recorder. Operationally, the new unit records and plays back at three speeds (7 1/2, 3 3/4 and 1 7/8 ips), offering a maximum of 12 hours performance in stereo or 24 hours in monaural on 1200ft. of tape (longer with extended play tapes). Other featured conveniences include a "V" control function selector, three-speed shift lever, illuminated dual recording level meter, separate channel record keys and volume controls, dual channel tone control and front panel



stereo headphone jack. An end-of-tape automatic stop switch provides professional-type recording and playback capabilities. Although complete with power amplifiers, the unit also



can be used with existing stereo amplifiers and speakers. Wow and flutter is reportedly less than 0.2% rms at 7½ips, output power 8w total peak (4w per channel), signal/noise ratio better than 40db, frequency response 50Hz to 15kHz at 7½ips, separation better than 40db and cross-talk better than 55db. The unit is housed in a leather pattern vinyl-over-wood cabinet and weighs 28lb. Suggested list price is \$199.95. Craig.

#### Antenna Display 705

Announced is the availability of a compact new self-merchandising display of exact replacement portable TV antennas. The display requires only 2ft. of floor space, yet holds as many as 360 exact replacement antennas. The company is said to be the only one



in the industry to offer a complete line of exact replacement antennas for all makes and models of portable TV sets. Each antenna is placed on a skin-pack display card with the make and model numbers of the TV sets it serves prominently indicated. The revolving display is shipped in three sections that reportedly can be assembled in just a

few minutes. It includes eye-stopping signs that explain the advantages of the antennas. JFD.

#### Component Turntable 706

Introduced is the component turntable, the latest in the company's stereo modular line. It includes a four-speed, 11in. turntable with a four-pole motor, magnetic cartridge and diamond stylus. It also has antiskate and cuing controls, low mass tone arm, automatic shutoff and lock, and output jacks for stereo system components. The turntable is complete with a bookshelf size



base and tinted plastic dust cover. Also, nine color TV sets, eight stereo instruments have been added to the line. Suggested retail price \$79.95. Sylvania.

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# COLORFAX

## MOTOROLA

### Color TV Chassis TS915/TS191 Service Tips

**Symptom:** CRT warm-up is slow with the quick-on switch in the "on" position. A low brightness condition is evident and the CRT has appearance of being soft (gassy). **Cause:** Insufficient CRT heater voltage when set is on. **Solution:** Turn set on. Make note of picture brightness and the intensity of CRT heaters. Set quick-on defeat switch (rear of set) to off position. If the picture brightness or CRT heater intensity decreases, the master on/off switch on front of set is defective (Part No. 40P65171A81). **Alternate check:** Measure filament voltage on CRT. It should be about 3.5v when set is turned off, but in the standby position. Turn set on. Filament voltage should increase to 6.3v. If it doesn't, the master on/off switch is defective.

Do not adjust ABL and/or G2 controls above normal to overcome low CRT heater voltage. Over adjustment may cause excessive load on horizontal panel (F). CRT may be damaged if operated with low heater voltage.

## RCA VICTOR

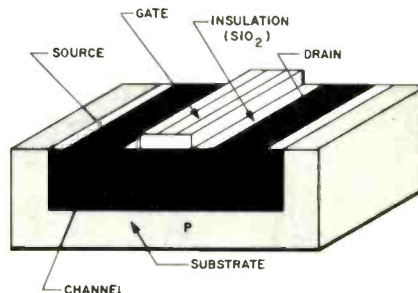
### Color TV Chassis CTC40—the MOS Field-Effect Transistor

The KRK142 tuner used in the CTC40 color chassis features an RF amplifier stage using a special type dual-gate MOS-FET transistor. To those not acquainted with this terminology, the MOS-FET is a Metal Oxide Semiconductor-Field Effect Transistor. Because a solid-state device of this type has not been previously used, it would be wise to acquaint the reader with some interesting facts about this new transistor.

The MOS-FET combines the advantages of solid-state devices (small size, low power consumption and mechanical ruggedness) with a very high input resistance and linear over-all transfer characteristics that closely resemble those of a pentode vacuum tube. In many respects an MOS-FET controls electron flow by the action of an electrostatic field. This implies that the signal input need not supply current, as is necessary in the case of driving the base of a transistor.

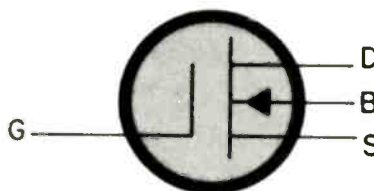
The input element of the MOS-FET

consists of a metal control electrode (gate) that acts as one plate of a capacitor—the other plate consists of the semiconductor material. A charge applied to the gate electrode produces an equal but opposite charge in the semiconductor layer (channel) located directly beneath the gate. This charge in the channel area controls conduction between two additional electrodes known as the source and drain, which



are applied to the opposite ends of the channel. As shown in the illustration, the gate electrode of a MOS-FET is comprised of a metallic contact separated from the semiconductor channel by an extremely thin layer of silicon oxide which acts as an insulator (capacitor dielectric). In the depletion type device illustrated, a negative charge applied to the insulated gate electrode will deplete the source-to-drain channel of electrons. When a positive charge is applied to the gate electrode, conductivity will increase, resulting in increased electron flow. Because the source-drain current is controlled entirely by varying the electrostatic charge on the gate control electrode, no current is required to bias the input of the device. Therefore, the MOS-FET has an extremely high input resistance.

### N-CHANNEL DEPLETION-TYPE



The manufacturing processes used to produce MOS transistors are similar to those used for high-speed silicon switching transistors. Production starts with a lightly doped wafer of P type silicon material. After a polishing operation, the wafer is oxidized in a furnace and photo-lithographic techniques are

used to etch away the oxide coating, exposing bare silicon in the source and drain regions of each of the multitude of transistors that are being formed on the wafer. The source and drain regions are next formed by diffusing an N type material such as phosphorus into the wafer.

This diffusion operation forms a bridge (channel) between the source and drain electrodes.

The wafer is again oxidized to cover the bare silicon regions and a second photo-etching step removes the oxide overlaying the contact regions. In the next step, metal is evaporated over the entire wafer and another photo-etching step removes all metal not needed to produce ohmic contacts to the source, drain and gate electrodes. Finally, the many MOS-FET's on the wafer are mechanically separated and mounted on individual headers. Connection wires are then bonded to the metalized regions and each unit is hermetically sealed in its case. Courtesy of RCA Sales Corp.

## WESTINGHOUSE

### Color TV Chassis V8001—Automatic Chroma Control and Color Killer Circuit Description

Automatic Chroma Control (ACC) maintains the chroma amplifier output by establishing feedback from the emitter of Q501.

When a color signal is received, a nominal -5v is developed across R530, R531 and fed to the base of Q501. Voltages at the base and emitter of Q501 will vary depending on the magnitude of the burst. This sets up a variable forward bias on the base of Q501 and the emitter voltage varies in proportion to this changing base voltage. A part of the changing emitter voltage is fed back to the grid of the chroma amp thus changing the bias.

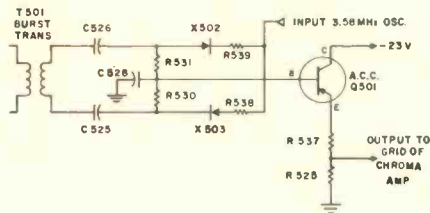
A burst signal of lower magnitude develops a lower voltage on the resistors R530, R531, which in turn provides a lower base voltage and therefore, less conduction of Q501.

A burst signal of higher magnitude develops a higher voltage across resistors R530, R531, in turn providing a higher base voltage to Q501. Under this condition, the transistor will conduct more. Accordingly, the emitter voltage of Q501 will also go up or down depending on the magnitude of the burst signal on the base.

During B/W transmission, only the local 3.58MHz oscillator signal is fed to the diodes X502 and X503. The output across R530, R531 is zero volts and fed to the base of Q501. Now, with the base voltage more positive than the emitter, the PNP transistor is cut off.

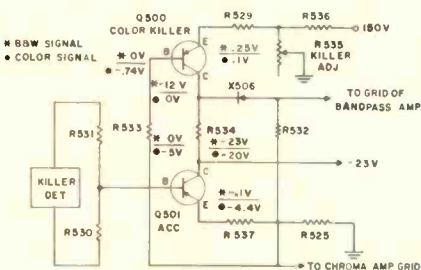
The function of the color killer is to

cut off the bandpass amplifier when color is not being transmitted by the station. Therefore, the color killer is a switching operation, either conducting or non-conducting. The color killer and ACC are closely related in this set. In fact, the color killer is activated by operation of the ACC amplifier which is fed by the killer detector diodes.



In some color television chassis, the color killer is cut off when color information is being received and the bandpass amplifier conducts. In the 14in. chassis, however, the color killer transistor conducts during color transmission. To understand the operation of Q500, we will start from a condition where no color is being transmitted. With no burst signal present at the killer detector diodes, X502 and X503, the only signal present is the 3.58MHz of the receiver oscillator; zero voltage is developed across the balanced resistors R530 and R531. Therefore zero voltage is fed to the base of Q501, a PNP transistor. With zero at the base and (-.1v) at the emitter, the transistor is cut off.

The emitter of Q501 is coupled to the base of Q500 by R533. With Q501 cut off, zero voltage is applied to the base of the PNP transistor Q500, and Q500 is cut off. The collector voltage when Q500 is cut off is -12v. This negative voltage on the cathode of X506 forward biases the diode and the negative voltage is fed to the grid of the bandpass amplifier, V12A.



This bias, when applied to the grid of the bandpass amplifier drives the grid well into the cut-off region. Therefore, no color information or noise can get through to the demodulators.

With a color program being received, the burst amplifier and transformer will have a signal present to feed into the killer detector diodes which are still receiving the 3.58MHz signal from the oscillator. The output of the killer detector is a negative 5v with a strong color signal being received.

The tuning of the receiver and the

amount of burst received from the transmitting station will determine the voltages being applied to the ACC and chroma amplifier. Use of a color bar generator while troubleshooting these circuits will stabilize the readings.

With -5v on the base of Q501, it will conduct, causing a voltage drop across R525 of approximately -2v. This voltage, when fed to Q500 through R533, places approximately -0.7v on the base, thereby turning on Q500 as you would a switch.

Therefore, the center of the two 15K emitter resistors, acting as a voltage divide, is fed to two places. It is fed to the grid of the chroma amplifier where the voltage will contribute to the bias and vary the gain of this tube according to the amount of burst received by the killer diodes. It is also fed to the base of the color killer, Q500, which is turned on by this negative voltage. The collector of Q500 is reduced to zero from -12v by current flowing through the collector resistor, R534. With zero volts on the cathode of diode, X506, it is now non-conducting and an open circuit. With no additional bias added to the grid of the bandpass amp from Q500, the bandpass amplifier tube will now conduct, passing color. Transistors and diodes are used, giving the chassis solid-state reliability.

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CONDUCTIVITY	None	None	Slight	Slight
ANTI-STATIC PROTECTION	Excellent	Fair	Poor	Poor
DRIFT	None	Slight	Yes	Yes

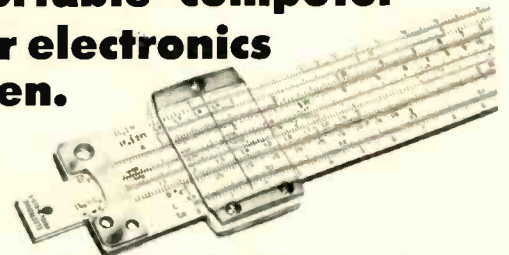
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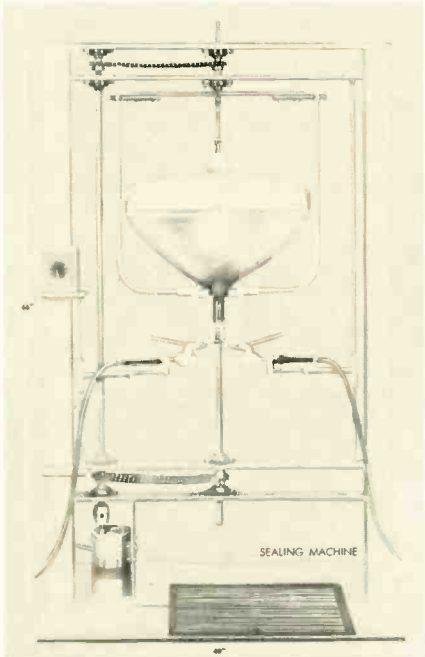
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For additional information on products described in this section, circle the numbers on Reader Service Card. Requests will be handled promptly

### CRT Rebuilding Equipment 707

Introduced is the CRT Color Champion. The equipment reportedly will rebuild all types of picture tubes, color or B/W, using standard components. According to the manufacturer, the

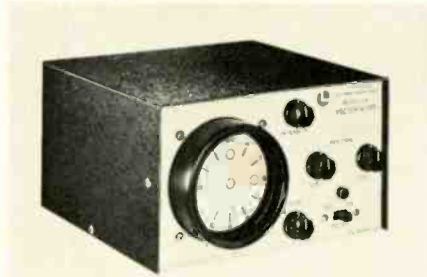


nominal low cost of operating the rebuilding equipment will offer the service technician an excellent profit return. Free installation and training is offered anywhere in the continental United States. The CRT plan offers everything required to get into this profitable business with a reasonably small investment. The profit from the tube rebuilding business is said to exceed the initial investment. CRT.

### Vectorscope Indicator 708

Introduced is a new vectorscope indicator, Model V5 for use with any standard color bar generator using the 10 bar keyed-rainbow color signal. The vectorscope is an essential instrument for service technicians who are now trying to service color TV without a complete vectorscope-color bar generator unit. With this instrument and a color bar generator, the serviceman reportedly can check and align bandpass-amplifier circuits as well as demodulators to any angle: 90, 105 or 115deg, and pinpoint troubles to a specific color circuit. An improper vector pattern loca-

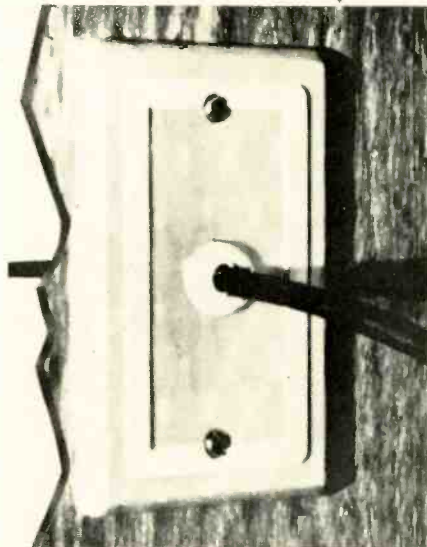
lizes the trouble to the particular circuit affecting either vector amplitude, vector angle or vector shape. The vec-



torscope indicator reportedly checks color amplifier gain, adjusts color sync circuits and allows proper centering of the hue control. Size: 7 3/8 in x 4 1/4 in x 7 5/8 in.; weight 5lb. New price is \$79.50. Lectrotech.

### Feed-Through Wall Plates 709

Feed-through wall plates, designed for ease of installation, eliminating time-consuming connections at the wall, are introduced. Although especially useful for multi-unit MATV-CATV systems, they adapt to any installation not requiring a connec-



tion at the wall. The new simple design features a single hole versatile enough to accept TV coax, telephone line, audio speaker line, rotor lead-in, circular cable or other wire up to 1/4in OD. Mounting on any surface is accomplished with two wood screws, toggle bolts, Mosley F-9 brackets (standard in M-1PK) or standard ac electrical outlet boxes. Units are available in decor-blending standard ivory. Mosley.

### Meter Attachment 710

A new, low-cost meter attachment capable of converting Millivolt Commander instruments (and other 10Ω centerscale meters) to read resistances of oneΩ and less is announced. The unit will convert instruments to read the value of voltage dropping resistors in solid-state power supplies as well as for testing transformerless transistorized audio power amplifiers where the output is normally in the 0.4 to 0.6Ω range. The model 870-3 unit also features nearly complete negation of normal in-circuit lead resistance. Additionally, the device under test (MOS-

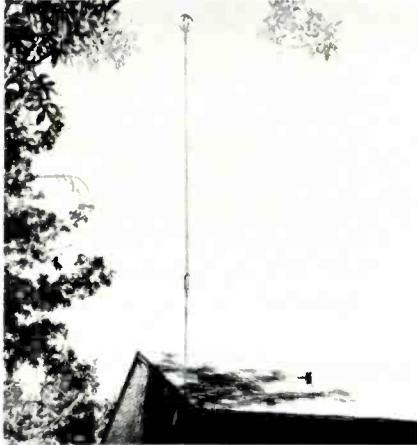


FET, IC, etc.) is now fully protected against accidental burnout; current has been limited to 100ma across 1Ω. Operationally, the meter is simply switched to 0.1vdc range and zero-adjusted in normal manner. The adapter cable is connected to meter input. With test leads unshorted, the attachment's "test" button is depressed and meter simultaneously adjusted for full-scale deflection. Now the test leads can be connected to the device being measured and the "test" button again depressed. To read out 0 to 1Ω resistance value, merely observe meter deflection and divide by 10. Price is \$14.95. Amphenol.

### CB Antenna 711

A dual gain, double dipole citizens band antenna with omni-directional gain is announced. The Model M217 Super Collinear antenna is claimed adjustable to radiate a directional signal with an 8db rejection of interference in any direction chosen by the user. The antenna achieves its performance using two 1/2-wave length

dipole radiators, one above the other, with 1/8-wave length separation. The double radiation patterns are additive and the composite pattern is lowered toward the ground without need for ground plane rods. The result is a "dual-gain" effect--in excess of 5db. The upper 1/2-wave dipole is 17ft long and mounts in a conventional manner. The second dipole is formed by a 22ft cable 1/8-wave separator. The 5db omni-directional gain is achieved by mounting the cable dipole at an



angle of less than 30deg from vertical beneath the antenna base. To reduce directional interference, a forward pattern of 5db gain with an 8db front-to-back ratio can be achieved by increasing this angle to between 45 and 75deg.

The antenna's phasing transformer provides resonance over the entire 23 channels. VSWR is 1.5 to 1 or less. A new "Stati-lite" ball is used to decrease receiver noise. The antenna has a direct ground for lightning protection. Impedance: 50Ω; weight 8lb. Antenna Specialists.

### Sweep and Marker Generator 712

A VHF sweep, UHF sweep, crystal controlled marker generator and a marker adder are incorporated in a single instrument. A complete alignment instrument, the SM152 provides linear sweep from 10MHz to 920MHz for all TV and FM work. Its sweep frequency generator is calibrated in MHz and also in TV channel numbers for exceptionally fast use. An exclusive feature is the sweep width calibrated from 0.3MHz to 15MHz with calibration unaffected by the frequency generated. A swept 3.58MHz chroma signal added to RF output checks chroma response in the over-all system through IF and bandpass amplifiers. Chroma is also available at the chroma output jack for direct injection into bandpass amplifiers. Crystal-controlled markers are provided for both IF and RF. By pushing a button, a crystal-controlled marker appears on the sweep response curve. Markers for IF and chroma

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## ET/D NEW PRODUCTS

alignment are 39.75, 41.25, 41.67, 42.17, 42.67, 44.25, 45.75, 47.25, 4.5, 3.58 and 3.08MHz. Markers at the RF video carrier on channels 4, 5, 10 and 13 are also available at the push of a button. The sound RF carrier is obtained by pushing the 4.5MHz push button on any RF channel. An extra push button and crystal jack are provided to add other crystal mark points

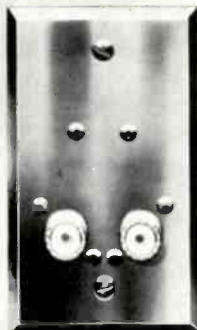


if needed. Special FM crystal markers of 10.7, 10.6 and 10.8MHz are generated simultaneously to view the center FM frequency with 100kHz markers on each side when viewing the "S" curve during alignment. This is claimed to save considerable time when determining bandwidth in FM stereo alignment. The instrument also provides a special variable marker generator for IF spot alignment of old sets. A variable oscillator from 39 to 48MHz is available.

The SM152 features post marker injection on all markers. An oscilloscope is the only other equipment needed for complete alignment. Price \$349.50. Sencore.

## ETV Tapoffs 713

A new series of tapoffs designed to meet the needs of educational TV is introduced. The dual output tapoffs are mounted on stainless steel



plates. They can handle all UHF, VHF, FM and sub-channel TV channels, plus closed circuit TV and 2.5GHz

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ETV signals. Called "DuoTaps," the units are back-matched to accept CCTV camera, video tape recorder or complete ETV studio inputs. The tapoff fits into any standard electrical outlet box. They use SO-239A with Teflon inserts as output connectors and F fittings for through line connectors. The tapoffs pass dc to 890MfHz through the trunk line, but block power to their taps. Thus, they can be used in systems including cable powered line extenders and other accessories. Aside from back-matching, the outstanding electrical feature of the units is that they cause relatively low signal loss. They are available with isolations of 12db, 17db and 23db, flat across the entire sub, VHF, FM and UHF spectra. Designated Models D-5601 (12db), D-5602 (17db), and D-5603 (23db), the tapoffs list for \$10. JFD.

### Solid-State Power Supply 714

Two bench-type regulated dc power supplies representing entrance into the solid-state power supply market are announced. The WP-700A (single unit) and WP-702A (dual unit) are solid-state constant-voltage dc power supplies that are reportedly ideally suited for use in circuit design, servicing, industrial and educational applications. The WP-700A and WP-702A are identical, except that the WP-702A is a dual unit with separate controls,



output terminals and meters for each section. The two sections of the WP-702A are electrically isolated from each other. Output voltage of the units is continuously adjustable from 0 to 20v, at current levels up to 200 $\mu$ a. The circuit automatically limits the overload current to prevent damage to the power supply. The supplies will not be damaged even if connected to an external short circuit. A special overload indicator lamp on the panel will begin to glow when the current level approaches the 200 $\mu$ a rating and will glow brightly if the current exceeds 200 $\mu$ a. A meter is provided to indicate either output voltage or current level. The meter function is selected by a convenient panel switch. Silicon transistors and diodes are used in the power supplies. Circuit design features include a negative-feedback regulator circuit to maintain constant output voltage with low ripple.

Three convenient five-way output terminals (+DC, -DC, and GND) are provided. The units are equipped with a three-wire ac power cord to permit connecting the external circuit to the power line ground using the "GND" terminal. The units are compact and lightweight with attractively designed functional panels. The WP-700A measures 4 x 6 $\frac{1}{2}$  x 3in. and weighs 3 lb. The WP-702A measures 6 x 12 x 3in., and weighs 3 lb, 10oz. Both supplies have rugged metal cases finished with blue-gray hammertone enamel. The WP-700A shown is priced at \$48 each and the WP-702A is \$87 each in quantities of one to four units. RCA.

### Tape Head Cleaner

715

A new aerosol-type cleaner for all audio and video magnetic tape heads, guides and film gates is announced. The new product, Audio-Video Tape Head Cleaner, is said to be completely safe for use on all types of recording heads and will quickly remove all dirt, film and oxide buildup that detracts from the unit's performance. The new cleaner will not harm valuable tapes, tape coatings or the finish of the recorder itself. When used as directed, the cleaner will not interfere with transmission and may be safely applied on running tape. The cleaner is non-

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Tests all tube types, old and new, plus transistors. Tests Magnovals, Nuvistors, 10-pin Decals, Compactrons, Novars, 10-pin types, foreign and hi-fi tubes, thyatrons and industrial types. Tests for true dynamic mutual conductance (GM). Spots shorts, leakage and gas. Tests Color and B/W picture tubes with use of MH-3A Multi-Head Adapter (optional). Lever switch test principle overcomes obsolescence. Automatic line voltage regulation.

\$129<sup>55</sup>



### Model 1101—DELUXE TUBE TESTER

For new Magnovals, Decals, Nuvistors, All Popular Picture Tubes and most other receiving tube types. Checks tubes for dynamic cathode emission, shorts, grid leakage and gas. Picture Tube Adapter. Exclusive 2-point test principle safeguards against obsolescence.

Kit—\$499<sup>55</sup>/Wired—\$699<sup>55</sup>



### Model 1100B—TUBE TESTER

Tests more tube types than any other tester in its price range. Tests for dynamic cathode emission, shorts, grid leakage and gas. Exclusive meter bridge circuit found only in more expensive testers. Professional quality at an economical price.

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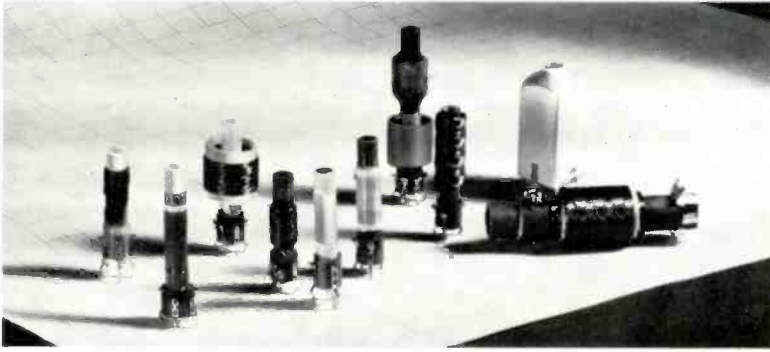
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6356	Blue Phasing	GE	ET36X789
6059	Burst Phase	Hotiman	109-033700
6357	Pin Cushion	Motorola	24C65127A90
6060	Chroma Take-Off	Philco	32-4878-2
6358	Horizontal Linearity	RCA	120794
6359	Horiz-Osc. & Waveform	Silvertone	10-88-5
7150	Sound Take-Off	Sylvania	50-16206-5
6061	3.58 mHz Osc.	Wells Gardner	9A2660-001



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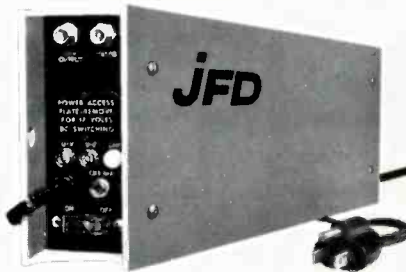
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## ET/D NEW PRODUCTS

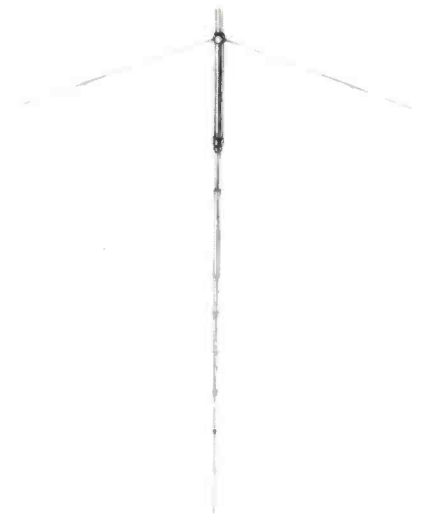
toxic, non-conductive, non-flammable and makes the proper care and maintenance of costly recording equipment a safe, simple task. The new cleaner



is being offered in a king-size 16oz aerosol can equipped with a 6in spray extension enabling the user to pinpoint the spray at normally hard-to-reach tape heads. Net price is \$2.35 per can. G. C. Electronics.

### Base Station Antenna 716

A series of professional base station antennas for use in the 25 to 50MHz frequency range is announced. Designed to meet or exceed all EIA Standards for base station antennas



(RS-329), the ASP-600 series will handle 500w of input power with re-serve. A true 3db omni-directional gain provides reliable system operation. A

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new high-strength aluminum alloy is used in the radial and support tubes. This material, combined with the fiberglass reinforced coil jacket which shares the flexural load of the wind, is said to provide a 100mph load rating with a 1.65 safety factor. A molded neoprene suspension gasket separates the base tube of the radiator and the transformer to seal out moisture for the life of the antenna. The braided transformer jacket design also provides excellent ultraviolet stabilization characteristics. The antennas are dc grounded to minimize precipitation static and reduce receiver noise interference. Tunable radials provide for maximum decoupling of RF. Three models in the series cover 25 to 28, 30 to 40 and 40 to 50MHz. Antenna Specialists.

### Oscilloscope 717

Announced is the model LBO-52B, a 5in. oscilloscope with a bandwidth of dc to 10MHz and featuring hybrid circuitry. The 10mv/cm sensitivity makes it especially suitable for examining low level signals such as in tuners and IF amplifiers. The linear wide sweep range has automatic synchronization. The vertical and horizontal inputs are direct coupled with push-pull amplifiers for distortionless display. The unit provides vector pattern dis-



play for color TV circuits to view patterns at the chroma detector and to align the chroma section of color TV. Specifications: Vert. Axis: deflection sens. 10mv P-P/cm or better. Bandwidth, at -3db dc: dc to 10MHz. ac: 2Hz to 10MHz. Input control X1, X10, X100, X1000 and fine adj. Calibration voltage 0.05v P-P at line frequency. Horiz. Axis: sens: 300mv P-P/cm or better. Bandwidth, at -3db dc: dc to 500 kHz. ac: 2Hz to 500KHz. Input Control X1, X10 and fine adj. Sweep Circuit Frequency: 1Hz to 200kHz in six steps: H-TV at 15.7kHz/2. Synchronization: Int + E -, Ext and Line. Size and weight: 10½ x 8 x 16½in., 24 lb. Price is \$199. Leader.

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- Provides a special test for critical RF transistors.

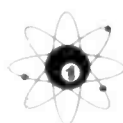
**FLIP KNOB TO RIGHT**

- Tests all single and dual gate FETs for true mutual conductance in or out of circuit. Gm gain is read in micromhos.
- Checks FETs out of circuit for  $I_{GSS}$  leakage in microamps.
- Provides special  $I_{GSS}$  (zero bias) current checks for industrial "culling."

## PLUS:

- (1) A special check for crystal diodes in or out of circuit for proper front to back ratio.
- (2) Sencore's own exclusive transistor/FET reference book that lists the transistor and FET gain and leakage figures as tested by the TF151. Over 12,000 listed.

With just the "flip of a switch" the Sencore TF151 can test ALL your transistor problems in or out of circuit. Stop by your distributor today and ask for a free demonstration... you'll be convinced too! **only \$12950**



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## NEW FIELD EFFECT MULTIMETER

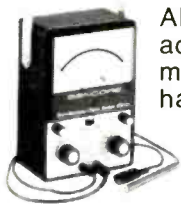
Here is the revolutionary new approach to circuit testing, the solid state Sencore FIELD EFFECT METER. This FE14 combines the advantages of a VTVM and the portability and versatility of a VOM into a single low-cost instrument. This is all made possible by the use of the new space age field effect transistor that is instant in action but operates like a vacuum tube in loading characteristics. Compare the features of the FIELD EFFECT METER to your VTVM or VOM.

Minimum circuit loading — 15 megohm input impedance on DC is better than a VTVM and up to 750 times better than a 20,000 ohm per volt VOM — 10 megohm input impedance on AC is 20 times better than a standard VTVM. The FIELD EFFECT METER is constant on all ranges, not like a VOM that changes loading with each range.

Seven AC peak-to-peak ranges with frequency response to 10MHz. Seven zero center scales down to 0.5 volt. Five ohmmeter ranges to 1000 megohms. DC current measurements to 1 ampere. Full meter and circuit protection. Mirrored scale. Low current drain on batteries — less than 2 milliamps. Built-in battery check. Unbreakable all-steel vinyl clad case. Optional Hi-Voltage probe adds 3KV, 10KV and 30KV ranges with minimum circuit loading for greatest accuracy in the industry... \$9.95.

### FE16 HI-ACCURACY FIELD EFFECT METER.

All of above features, plus unmatched accuracy — 1.5% on DC, 3% on AC. High-style meter, knobs, and special meter-tilting handle. \$84.50.



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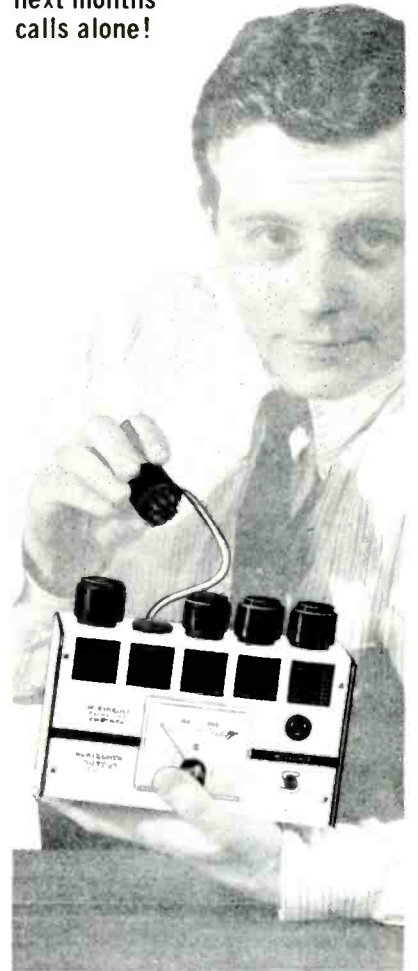
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Especially useful on color TV where a slight misadjustment of horizontal linearity or efficiency coils drives cathode currents sky high! 5 pre-wired sockets for all popular horizontal output tubes lets you plug into circuit fast—no clipping or unsoldering of leads! **\$34.50<sup>Net</sup>**

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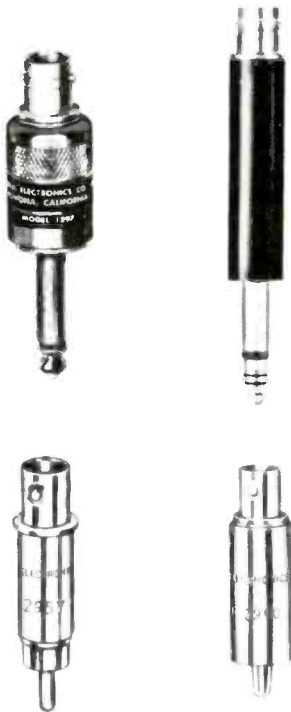
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## ET/D NEW PRODUCTS

### Test Adapters 718

Four new BNC plug conversion adapters are introduced. These adapters make it possible to convert coaxial test cables fitted with BNC plugs to any of four other plug types. The model 1297 converts to standard 1/4in. diameter shielded phone plug; model 2798 con-



verts to 0.250in. diameter phone plug (PJ-015/WE 310) for equipment using three-circuit phone jacks; model 2957 converts to shielded phono plug; model 2990 converts to shielded banana plug for equipment having banana jacks or binding posts. Net priced: model 1297, \$5.85; model 2798, \$6.85; model 2957 and 2990, \$2.50. Pomona Electronics.

### Portable TV 719

Introduced is a B/W TV Model TV110U. This solid-state model has an 11in screen (measured diagonally)

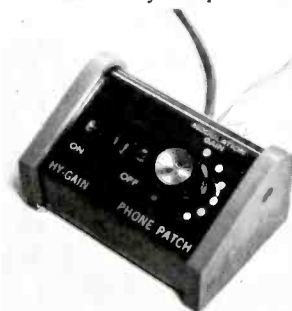


and is said to produce a sharp, clear picture for small or large audiences. A snap-in sunglass filter reportedly gives bright, glare-free reception in any light. It operates on regular house current, a Sony battery or car/boat 12v battery. With a choice of power, the TV110U is expected to be popular in homes, on boats, at beaches and camps. The portable comes in black with silver trim. An earphone is provided for private listening. Price \$139.95. Sony.

### CB Phone Patch 720

Introduced is a phone patch that will interconnect any base CB with the

telephone and thus reportedly extend a CB call to any telephone in the nation.



The unit is particularly important in emergencies for contacting police or other public safety and emergency

*Continued on page 86*

## New idea in sound columns from Argos ...serves up superb voice and music



Beautiful new solution to those small, multiple-use locations where full-size Sound Director columns can't be justified — yet the situation calls for prestige, faithful sound reproduction and versatility.

Especially suited to restaurants, club rooms, schools and offices up to 60 feet, where speech quality may be critical one day and music the next.

Unique contemporary "art frame" cabinetry in hand-rubbed, oil-finished genuine walnut. Six speakers, 16 ohms impedance. Response from 100 to 12,000 cps at 30 watts.

### Model ESD-1061

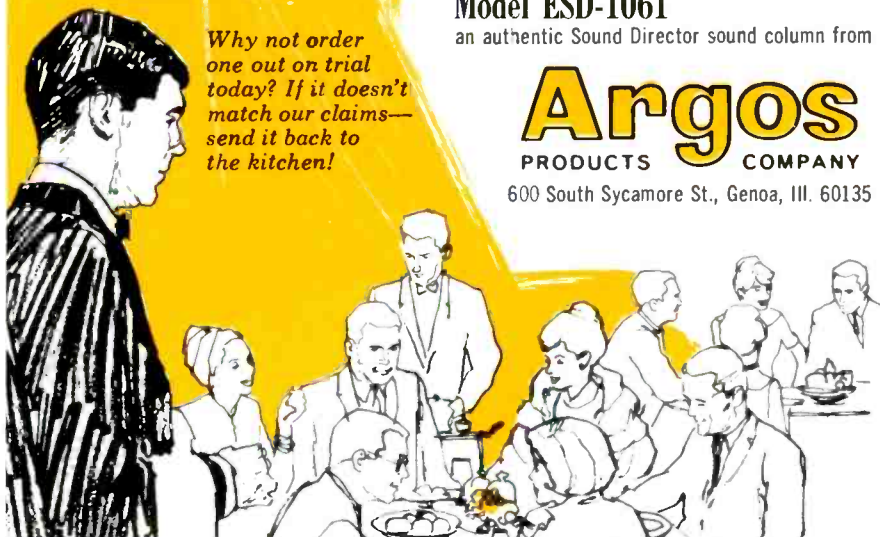
an authentic Sound Director sound column from

# Argos

PRODUCTS COMPANY

600 South Sycamore St., Genoa, Ill. 60135

*Why not order one out on trial today? If it doesn't match our claims—send it back to the kitchen!*



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# Weller®

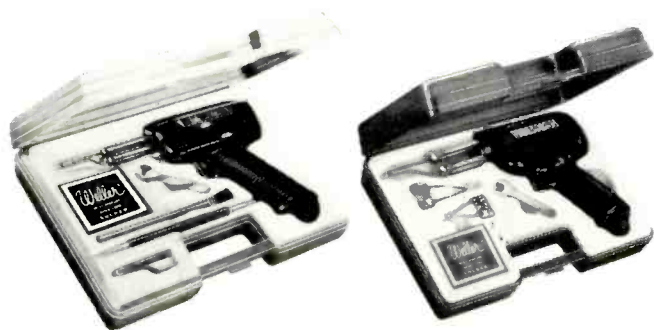
## ...the soldering tools professionals depend on



### The original Dual Heat Soldering Guns

Preferred by technicians for their fast heating copper tips, exclusive trigger-controlled dual heat, and high soldering efficiency. Available in 3 wattage sizes, each with spotlight.

100/140-watt Model 8200, 145/210-watt Model D-440, and 240/325-watt Model D-550. Also in complete kits:



**Utility Kit** includes Weller 100/140 watt gun, extra tips, tip-changing wrench, flux brush, soldering aid and solder. **Model 8200PK**

**Heavy-Duty Kit** features Weller 240/325 watt gun with soldering, cutting and smoothing tips, wrench and solder. **Model D-550PK**

### Dependable MARKSMAN Irons in a size for every job



Ideal for deep chassis work and continuous-duty soldering, Marksmann irons outperform others of comparable size and weight. All five feature long-reach stainless steel barrels and replaceable tips.

- 25-watt, 1¾-oz. Model SP-23 with 1/8" tip (In kit with extra tips, soldering aid, solder—Model SP-23K)
- 40-watt, 2-oz. Model SP-40 with 1/4" tip
- 80-watt, 4-oz. Model SP-80 with 3/8" tip
- 120-watt, 10-oz. Model SP-120 with 1/2" tip
- 175-watt, 16-oz. Model SP-175 with 5/8" tip

Complete Weller Line includes replacement tips and solder

**WELLER ELECTRIC CORPORATION, Easton, Pa.**  
WORLD LEADER IN SOLDERING TOOLS

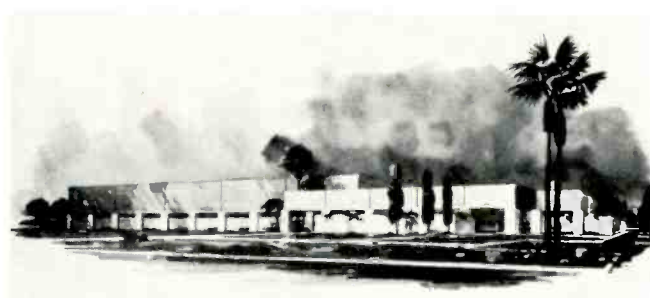
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## ET/D NEWS OF THE INDUSTRY

### Shure To Build Plant in Phoenix

Shure Electronics of Arizona, Inc., a wholly owned subsidiary of Shure Brothers, Inc., a major manufacturer of microphones, high fidelity components and related products, today broke ground for a new, ultra-modern assembly plant to be located at the intersection of 21st Ave. and Cheryl Drive in Phoenix.

Upon completion, the new plant will house a product assembly operation and a warehousing facility which the company has maintained in Phoenix for approximately two years in separate, leased locations. All of the approximately 125 people presently employed by Shure in Phoenix will move to the new building when it is completed early next spring.



The new building will contain 63,400sq. ft., with approximately 52,000sq. ft. devoted to production and 8000 sq. ft. to personnel facilities, including a modern cafeteria. The balance of space will be occupied by administrative offices. All areas will be completely air-conditioned. A 60,000sq. ft. employee parking lot will be provided adjacent to the building. The building site allows for ultimate expansion of the plant to 170,000sq. ft.

### Integrated Chroma Demodulator For Color TV

An integrated-circuit chroma demodulator requiring only the chroma signal and two reference phases to produce low-impedance color difference signals for driving the output stages directly is now available from Motorola. Designated MC1325, the device is said to be considerably more economical than a comparable color TV chroma demodulator built with individual components.

Motorola designed the chroma demodulator to allow the circuit designer as much freedom as possible in color rendering and yet keep the number of required external components at a minimum. For example, the R-Y: B-Y signal ratio can be modified by addition of an external resistor. To eliminate grey-scale drift, temperature-compensated networks are built into the monolithic chip.

The unit is supplied in both the dual in-line ceramic and the Unibloc plastic packages. It is available in evaluation quantities at \$2.50 each in lots of 100 through 999 units.

### Factory Sales of Color TV Sets Pass Monochrome Sales

Add another "first" in the television field as sales to dealers of color television sets on a year-to-date basis have exceeded the sales of monochrome sets.

Color television sales moved past monochrome sales for the first time during the week ending Oct. 18, according

to figures released today by Charles N. Hoffman, chairman of the Electronic Industries Assn.'s Consumer Products Div.

As compiled by the association's marketing services department in its weekly sales-to-dealers report, color TV sales through the week ended Oct. 18 amounted to 4,351,681, as compared with 4,343,243 sales of monochrome sets.

Hoffman said the report also shows that sales of monochrome sets increased 1.9 percent over 1967 sales for the same period, 4,343,243 to 4,262,237 while color TV sales increased 10 percent, 4,351,681 to 3,954,659.

Sales of color sets during the Oct. 18 week were reported to be 162,035 as compared with 140,841 sales of monochrome sets.

According to the EIA report, total television sales are up 5.8 percent over the same period a year ago.

### Semiconductor IC Sales Increase

U.S. factory sales of semiconductor integrated circuits totaled \$204 million during the first eight months of 1968, climbing 45.6 percent from sales of \$140 million during this period in 1967, the Electronic Industries Assn.'s Marketing Services Dept. reported.

With a 32.8 percent decline in average values, unit sales were up 116.8 percent during the eight-month 1968 period, reaching 83 million.

Sales of digital semiconductor ICs amounted to 71.7 million units valued at \$162.9 million during January-August 1968, up 111 percent and 48.1 percent, respectively, from unit and dollar sales during the comparable period last year.

Linear IC sales were up 163.6 percent and 36.4 percent to reach 11.2 million units valued at \$40.8 million, respectively, during the first eight months of this year.

### Field-Effect Transistors Show Gain

U.S. factory sales of field-effect transistors amounted to \$11.2 million during the first nine months of 1968, climbing 26 percent from sales of \$8.9 million during this period in 1967, according to the Electronic Industries Assn.'s Marketing Services Dept.

Unit sales of these devices were up 128 percent to reach 7.3 million during the nine-month 1968 period.

As a result of sales increases of field-effect transistors and "other silicon" types, total silicon transistor sales amounted to 492.6 million units valued at \$222 million during the first three quarters of this year, climbing 41.1 percent and 4.8 percent, respectively, from unit and dollar sales during this period last year.

The decline in sales of germanium transistors adversely affected total transistor sales during this period. Germanium transistors were off 29.9 percent and 32.9 percent in unit and dollar sales, respectively.

Total transistor sales amounted to 640.5 million units valued at \$282.6 million during the first nine months of 1968, rising 14.4 percent and decreasing 6.5 percent, respectively, from unit and dollar sales during the comparable period a year ago.

### Amphenol Radio and TV Test Equipment Lines Sold to Trippe

The Trippe Manufacturing Co. has agreed to purchase the Amphenol lines of two-way Citizens Band radios and television test equipment.

Barre Seid, president of Trippe Manufacturing, and Robert E. Svoboda, president of the Amphenol Distributor Div. of The Bunker-Ramo Corp., made the announcement jointly.

To service Color TV you need:  
 1. vectorscope  
 2. color bar generator  
 and you can't  
 use one without  
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## only the V7 gives you both

- The only complete one unit color vectorscope/color-bar generator available anywhere!
- Completely portable for servicing color TV in the home . . . no need to bring set to the shop!
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- Recommended by leading TV manufacturers!
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- Checks and aligns demodulators to any angle.
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- Pinpoints troubles to a specific color circuit.

**Exclusive Features:** Self-Calibrating—adjust timing circuit without external test equipment; Dial-A-Line—adjust horizontal line to any width from 1 to 4. Plus: All Crosshatch, Dots, and Color Patterns; Voltage Regulated; Fully Enclosed Cable Compartment. Free copy of Wayne Lemon's Book, "Color TV Servicing Simplified with Vectorscope." Net **189.50**

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The sale, effective Dec. 31, 1968, is for an undisclosed amount of cash. It includes all existing inventory and other assets.

Trippe will establish a new company, Commander Corp., to produce the radios and test equipment in facilities at 133 N. Jefferson St., Chicago. Terms of the agreement permit Commander to sell the current inventory of these products with the Amphenol name on them. However, all units produced by Commander will carry its name.

Initially the product line, pricing and general policies will be essentially the same. Commander will handle all warranty service.

Alfred N. Fischer has been appointed vice president and general manager of The Commander Corp. which will operate as a Trippe affiliate, Seid added.

Svoboda explained the prime reason for the sale of the businesses as the Amphenol Distributor Division's orientation towards the distribution of electronic components rather than the manufacture and sale of equipment. The division distributes the products, primarily electronic components, of five U.S. Amphenol divisions of The Bunker-Ramo Corporation.

**IC Brings Improved Quality To Domestic Color TV**

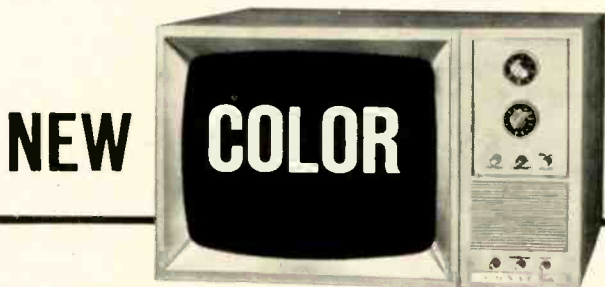
An integrated circuit developed in Britain facilitates the design of domestic color television receivers which give

the picture quality of a studio monitor set while retaining the long-term stability necessary for home usage. It also simplifies the work of the maintenance engineer. Its circuit chip measures only about 0.05in. sq. yet replaces 65 conventional components occupying an area of 36sq. in. The circuit is to be made available in the United States by The Plessey Co., which developed it in collaboration with Rank Bush Murphy Ltd.

The Color Picture Integrated Circuit, reportedly the first of its kind in the world, is applicable to the American NTSC system as well as the European PAL system.

By adopting an integrated circuit technique it has been possible to make use of a superior but more complex drive circuit using the Red-Green-Blue (RGB) system. This system is normally restricted to studio monitors because of its complexity and relative instability when conventional components are used. The integrated circuit eliminates the need for very accurate components or the necessity for a large number of preset adjustments.

Normally the type of drive circuit used for color picture tubes in domestic sets is the color difference drive, in which the color and the luminance information are applied to separate electrodes of each gun of the CRT. In this way the actual color signals are generated inside the tube by adding the two components in the electron stream. In the RGB system the luminance and color information are added to the color signals externally and these signals are applied to one electrode of the CRT only. The new circuit demodulates the two carrier chrominance signals and carries out the matrixing operations with the luminance and certain control signals to form accurately the red, blue and green signals themselves.



**NEW COLOR**  
**CONAR All-Channel COLOR TV KIT \$366.00**  
 Model 600UK

- Easier to build because it's designed for learning
- Complete with cabinet—nothing else to buy!

Tops for quality, simplicity of design, ease of building, the new CONAR 600 gives you the latest advances in the art of color TV receiver construction. In addition to 21 tubes, this all-channel receiver incorporates a transistor UHF tuner, transistor noise cancellation circuit and 16 solid-state diodes. Separate gun killer switches and a cross hatch generator are built in. All hardware is engineered for accessibility. Attractive bronze-tone steel cabinet with durable wood-grained vinyl covering.

For information write Dept. BS9C

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Model AMP-25/2

**MATV DISTRIBUTION AMPLIFIER KIT**  
**for 75 Ohm Coax VHF Color/B&W TV**



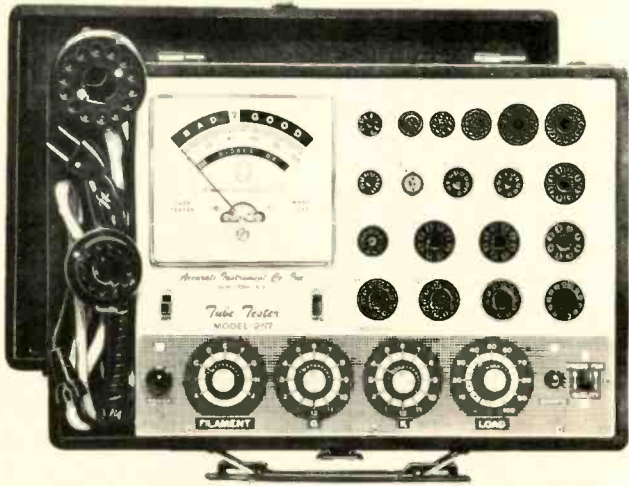
A gold mine waits for the man who can insure quality TV reception in fringe reception areas. Now it's easy for you to work that mine. Mosley's new MATV Distribution Amplifier Kit contains in one package all the components for a two-outlet amplified system. Simple system design. Easy installation. Loss factors already figured for you. Write Dept. 180 for details.

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ELECTRONIC TECHNICIAN/DEALER

# The New 1968 Improved Model 257 **A REVOLUTIONARY NEW TUBE TESTING OUTFIT**



**COMPLETE WITH ALL ADAPTERS AND ACCESSORIES, NO "EXTRAS"**

#### STANDARD TUBES:

- ✓ Tests the new Novars, Nuvistors, 10 Pins, Magnovals, Compactrons and Decals.
- ✓ More than 2,500 tube listings.
- ✓ Tests each section of multi-section tubes individually for shorts, leakage and Cathode emission.
- ✓ Ultra sensitive circuit will indicate leakage up to 5 Megohms.
- ✓ Employs new improved 4½" dual scale meter with a unique sealed damping chamber to assure accurate, vibration-less readings.
- ✓ Complete set of tube straighteners mounted on front panel.

The Model 257 is housed in a handsome, sturdy, portable case. Comes complete with all adapters and accessories, ready to plug in and use. No "extras" to buy. Only .....

#### BLACK AND WHITE PICTURE TUBES:

- ✓ Single cable used for testing all Black and White Picture Tubes with deflection angles 50 to 114 degrees.
- ✓ The Model 257 tests all Black and White Picture Tubes for emission, inter-element shorts and leakage.

#### COLOR PICTURE TUBES:

- ✓ The Red, Green and Blue Color guns are tested individually for cathode emission quality, and each gun is tested separately for shorts or leakage between control grid, cathode and heater. Employment of a newly perfected dual socket cable enables accomplishments of all tests in the shortest possible time.

**\$47<sup>50</sup>**

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Accurate Instrument Co., Inc.

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Try it for 10 days before you buy. If completely satisfied then send \$10.00 and pay the balance at the rate of \$10.00 per month until the total price of \$47.50 (plus P.P., handling and budget charge) is paid. If not completely satisfied, return to us, no explanation necessary.

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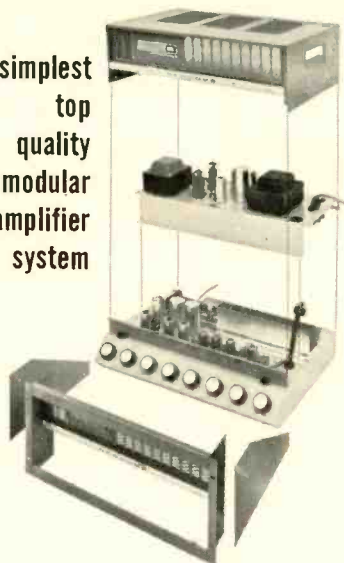
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Save Money! Check here and enclose \$47.50 with this coupon and we will pay all shipping charges. You still retain the privilege of returning after 10 day trial for full refund.

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Newcomb's finest, the Custom K Series is the climax of 30 years devoted to developing and producing the very best public address amplifiers. You quickly and simply get the combination of channels and power you need. A power output module is dropped into either a front-end or booster chassis. Two electrical plug-in connections; no soldering. Put a cover over the top or insert the chassis in a rack mount. You can plug in a transistorized VU meter accessory which has a sensitivity control and monitor jack for crystal headphones. The 4-channel models have provisions for a remote control accessory. There are 3 power amplifier modules: 40, 60, and 125 watts, and a power supply when you want to use a front end as a mixer-preamplifier only. There are three preamplifier modules: 3, 4, and 5 channels, and a chassis for making a booster amplifier out of any of the output modules. All in all, only 14 components permit 70 combinations. Performance is superb. Frequency response is  $\pm 1$  db 20-20,000 cps; distortion is extremely low. Custom K amplifiers run remarkably cool. Easy-to-trace, easy-to-service vacuum tube construction is used throughout. Colors are soft shades of gray-green. Write for Catalog K-15.

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Sylmar, California 91342

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## ET/D BOOK REVIEWS

**ORGAN BUILDERS MANUAL.**  
*Published by Artisan Organs, a division of Electronic Organ Arts, 1372 E. Walnut St., Pasadena, Calif. 91106. 259 pages, soft cover. \$5.*

Over 30 years ago, Robert L. Eby became interested in "the king of musical instruments." As a radio amateur and piano player, he found the organ combined his interests in both electronics and music. After completing his formal education in electronics, he continued to study organ playing as a hobby. The Kimball Pipe Organ Co. trained him in pipe organ design and installation.

After WWII he worked day and night adapting pipe organ techniques to a giant electronic organ in his home. Even before its completion, organ prospects began hounding him to obtain the same parts for them. The hobby soon grew to a full-time business. This book details the story of the corporation that developed from a hobby, a corporation that now ships organ kits all over the world. This is a book for the do-it-yourselfer. But it is more. It is packed with information for electronic technicians who will be called upon from time to time to adjust, service or give advice about these instruments. The volume covers typical organ specifications, tone generators, power supplies, amplifiers, speakers, tools and tuners, accessories, typical installations and many other specific subjects relating to electronic organs. We think every electronics home entertainment service-dealer should keep a copy on file.

**ABC'S OF ELECTRICAL SOLDERING.** *By Louis M. Dezzettel. Publisher, Howard W. Sams. 128 pages, 5½ x 7½ paperbound, \$2.95. (\$3.75 in Canada).*

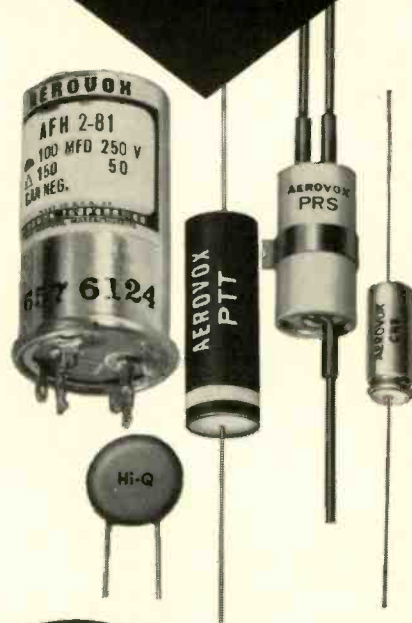
My first impression was, how can one write a 128-page book about soldering. As it turns out, the book is very informative. It explains not only the techniques of soldering, but the various types of solder, soldering irons, special devices for soldering printed circuit boards, methods of preparing leads for soldering and the importance of flux.

One of the chapters of special interest is devoted to solder repairs. It outlines procedures for solder repairs on printed circuit boards and component replacements. These are items that many manufacturers trust in service work. Technicians will find it an interesting review.

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ELECTRONIC TECHNICIAN/DEALER



## This tough customer from GE knocked the confusion out of color picture tubes!

It took GE's Willie Gorrell, a real *tough customer*, to end the head-scratching confusion you used to face when you needed a replacement color picture tube. General Electric's CRT production chief got right to the heart of the problem, tossed out the multi-line bewilderment and made possible *one* high-quality line—ULTRACOLOR. Now one line has a tube for every make and model . . . no more baffling combinations of specs, screens, glass and guns. ULTRACOLOR tubes are manufactured to all the essential original equipment specifications, utilize rare earth phosphor (except older types which *will* be identified as sulfide phosphor, if of that type), have new guns, and may or may not utilize used glass and other materials. Make ULTRACOLOR CRT's your choice every time. Look for the new white carton at your General Electric distributor's store.

288-27

GENERAL  ELECTRIC

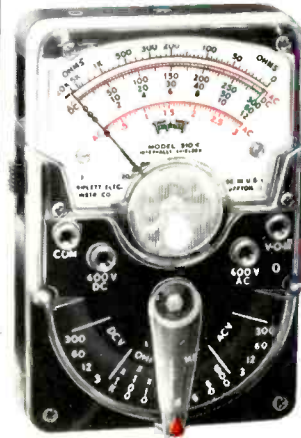


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World's Largest Selling  
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(SHOWN ACTUAL SIZE)



**MODEL 310-C**  
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- 1** HAND SIZE V-O-M WITH PROVISION FOR ATTACHING AC CLAMP-ON AMMETER.
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- 1** Hand size V-O-M with provision for attaching AC Clamp-on Ammeter.
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- 3** Single fully enclosed Lever Range Switch, plus DC Polarity Reversing.

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Comprehensive test sets. Model 100 includes: Model 310 V-O-M, Model 10 Clamp-on Ammeter Adapter; Model 101 Line Separator; Model 379 Leather Case; Model 311 leads. (\$83.20 Value Separate Unit Purchase Price.)



MODEL 100 — U.S.A. User Net.....\$78.00

MODEL 100-C — Same as above, but with Model 310-C, Net.....\$88.00

SELF-SHIELDED Bar-Ring instrument; permits checking in strong magnetic fields. FITTING INTERCHANGEABLE test prod tip into top of tester makes it the common probe, thereby freeing one hand. UNBREAKABLE plastic meter window. BANANA-TYPE JACKS—positive connection and long life.

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It all started with the hot-selling Dodge compact van. Big. Tough. And ready. And now, by popular demand, its versatility has been expanded to 20 models. Included are 13 Job-Mated units (like the one shown below), outfitted to handle the needs of just about any trade. And this year you can order your Dodge van with air conditioning, power steering or automatic transmission. Only Dodge offers power steering on compacts. More examples of Dodge being first with the most.

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The Custom Van is here, with over two dozen specially installed interiors that meet your business needs. This is the interior for TV repairmen. Complete with drawers for parts and tools. More room for carrying sets to and from your shop. Everything is stored away behind a security screen and under lock and key. Outside, an optional TV-mast and ladder rack for added convenience. See Job-Mated Dodge Tradesman, the hottest idea in trucks since the compact van.

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## ET/D NEW PRODUCTS

(Continued from page 77)

units. The unit can easily be connected to any CB transceiver in just a few minutes. It comes with complete instructions for installation and connection to telephone. List price is \$14.95. Hy-Gain.

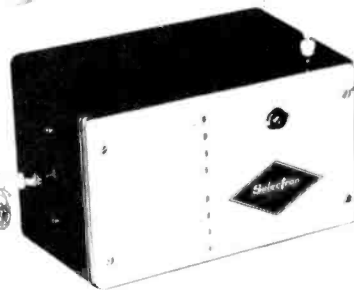
### Alarm System 721

A electronic alarm system which can be installed in one tenth the time of ordinary systems is developed.

The system employs frequencies from 265MHz to 285MHz, the range set aside by the FCC (Federal Communications Commission) for this purpose.

It is said to be the nation's first closed loop solid state wireless system. Older wireless systems are open loop, meaning that they are incompatible with traditional alarm system and can be defeated more easily.

An important feature of the system is that it can be triggered by tiny, per-



sonal transmitters. About the size of a pack of cigarettes, these transmitters can easily be carried in pocket or purse. The woman who encounters an intruder as she returns to her home can simply press the button on her transmitter and trigger the alarm.

A wide variety of accessories are available for the system, including fire detectors, automatic phone dialers to notify police and firemen and extra sirens or alarm bells.

In case of power failures, the system switches automatically to built-in battery operation. Price \$199.50. Selectron.



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**New BELL P/A MODULAR AMPS won't work in overload or short circuits**

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FREE LITERATURE



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## SOLID STATE . . .

*Continued from page 56*

broken "A" lead coil. See Fig. 2. Many times the coil has shaken loose from a plastic bracket, breaking the "A" connection. Clean the enameled wire, tin and solder back into place. Use rubber silicone cement to hold the coil firmly in position.

Torn fuse leads will cause the same trouble. After checking the "A" lead and fuse holder, check for open switch contacts on the volume control.

### Dead Low Band

In another automatic, Model TR-48 AT, the stations disappeared from 750kHz on down. Transistor TR2, the convertor-oscillator stage would not function on this portion of the radio dial. Replace the oscillator transistor to correct the trouble. If a transistor in-circuit checker is handy, check the transistor in the circuit. This will quickly tell you if the oscillator transistor is at fault or if the trouble lies in the oscillator coil or other TR2 components. See Fig. 4.

### Noise Elimination

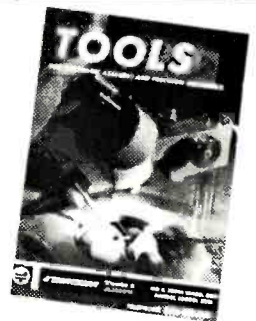
It is wise to install a noise filter capacitor on the generator assembly. Connect the capacitor lead to the armature terminal. Do not connect the capacitor to the field terminal of the generator. The terminal is generally tagged with a plate or red tag.

Disconnect the center lead in the distributor cap and install suppressor. The generator noise filter capacitor and distributor suppressor will normally eliminate all objectionable motor noise. Mount the tractor radio as close as possible to the tractor operator, eliminating close motor pickup noise and producing better reception.

An important aspect of servicing radios is to reason the difficulties. All too often the beginner is prone to guess sometimes changing a component that looks bad or worse yet hoping this may be the trouble. Logic will tell the technician to pause and reason what could cause this effect. Knowledge of the circuitry enables the technician to reason the nature of the difficulty or perhaps its exact cause. ■

## FREE CATALOG

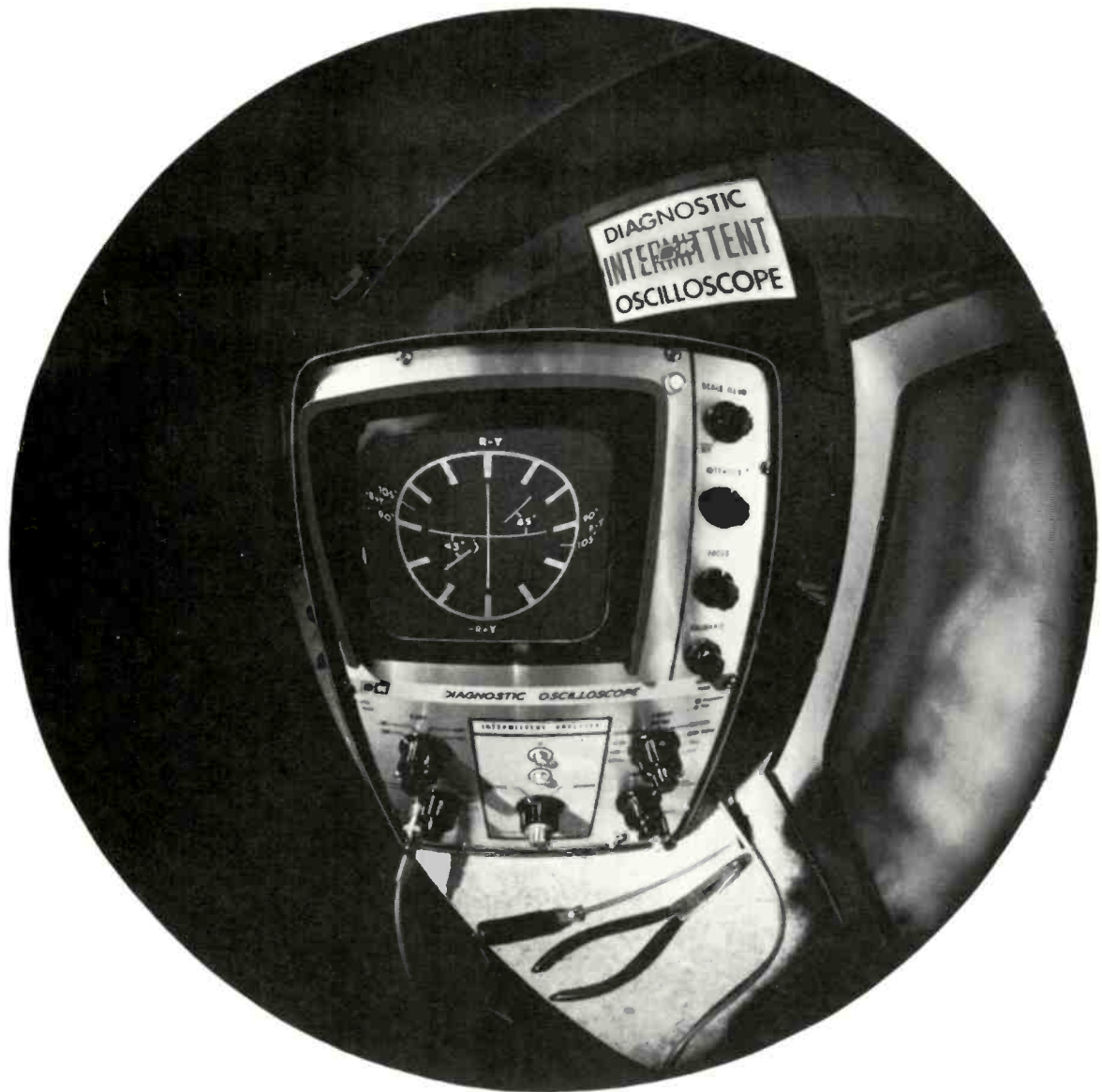
Lists over 1700 hard-to-find tools used by electronic technicians, instrument mechanics, engineers, and scientists. Included are many types of pliers, tweezers, wrenches, soldering irons, wire strippers, relay tools, watchmakers tools, drills, precision grinders, files, optical equipment, lighting, vacuum systems, tool cases, and tool kits. Included also are a solder section and four pages of useful "Tool Tips" with valuable data on fasteners, color coding, drill and metal gauges, insulation facts, and tool selection.



**JENSEN TOOLS and ALLOYS**  
3630 E. Indian School Road, Phoenix, Arizona 85018

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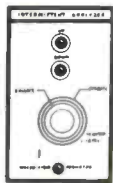
ELECTRONIC TECHNICIAN/DEALER



# Vectorious Oscilloscope.

There's a real victory in the making of this new B&K Diagnostic Oscilloscope. We're making the idea of using the oscilloscope popular again. And one of the victory signs is that our oscilloscope is also a vectorscope.

In fact, it's the only one that locates all vector inputs and controls on the front panel. Which is simply for your convenience. (Something for which oscilloscopes have not been noted.)



Here's another sign of victory: Our oscilloscope has an intermittent analyzer with electronic memory and optional audio/visual remote alarm. A diagnostic exclusive from B&K...

With it, the elusive intermittent conditions that make so many TV sets tough dogs can now be detected and identified in your absence. Preset one control. When the faulty stage is detected, you'll know about it as soon as you come back from service calls. Then run the scope overnight to check another set for an intermittent condition.

All this adds up to greater shop efficiency, more time for profit-making service calls and a lot more mileage out of a very fine diagnostic oscilloscope.

An oscilloscope that shows vector patterns exactly as specified by color TV manufacturers. And permits reading peak-to-peak voltages in all ranges on a double-scale calibrated screen—just by turning a switch. (As the range is selected, the appropriate scale

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Automatic synchronization locks in all patterns at any signal level or frequency. There are also fewer controls and these are positioned for easier operation.

Give our Diagnostic Oscilloscope/Vectorscope some thought. And you'll realize that it's a victory for your side, too. See your B&K Distributor or drop us a note for detailed literature on Model 1450 and our full-line test equipment catalog, AP-24.

**Model 1450, Net: \$279<sup>95</sup>**



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Where electronic innovation is a way of life.

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# Dyna-flex\*

the only practical probe for testing transistors in circuits.



Throw away your alligator clips! Dyna-flex, the world's first and only 3-point probe, makes instant test connections to transistors in printed boards. Easy to use, the Dyna-flex probes are spring-mounted on ball joints. Allow you to adjust to any spacing 1/32" to 5/8", using only one hand. Dyna-flex eliminates costly unsoldering; can be used to make temporary component substitutions on printed wiring boards. Each point is color-coded for fast, easy identification. Dyna-flex—another engineering breakthrough from B&K.

Model FP-3, \$12.95 user net



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## ET/D CATALOGS & BULLETINS

### Speakers 400

A new 16-page full-line catalog covering the company's entire line of original equipment and replacement speakers is available.

The catalog presents a comprehensive listing of the company's entire product line, representing a broad range of quality speakers for every known sound application.

The catalog is printed in the standard 8½ x 11in. page size. It is designed for convenient counter and file use, and should provide an invaluable sales aid and guide to all distributors and dealers as well as an ideal reference for all original equipment manufacturers. Oxford.

### Equipment and Components 401

A 132-page 1969 catalog, the biggest in the company's 22-year history is introduced. The new four-color catalog contains thousands of electronic items for the home, car and business. The catalog features brand name hi fi and stereo components, two-way communication equipment, televisions, auto tape cartridge players, closed circuit TV, intercom systems, portable radios, plus hundreds of component items. Team Electronics.

### HEP Cross Reference Guide 402

A new cross reference guide lists almost 18,000 semiconductors with their equivalents from the widely available HEP line. The HEP line, which reportedly offers the broadest coverage in the industry, is a series of devices for the hobbyist, experimenter and professional serviceman. It contains 175 devices that meet almost every replacement need and is one of the most complete cross references available. It lists EIA-registered 1N and 2N numbers, foreign devices and many house numbers used by both semiconductor and equipment manufacturers. The 64-page cross reference guide is a convenient 4¼ x 11in. and is punched to fit a standard three-ring binder. It also includes a table of equivalents, tips on using replacement devices along with their respective outline drawings and dimensions. Motorola.

### Solderless Terminal 403

A colorful "wall catalog" that simplifies selection of the correct style of

solderless terminal is offered. All styles of terminals and connectors are shown in actual size including non-insulated single grip, insulated single grip, insulated bell-mouth single grip, insulated nylon double grip and various styles of quick connects and adaptors ranging



from 6-22 AWG. Also shown are hand-operated attaching tools for both insulated and non-insulated styles. Each style of terminal is grouped as to wire size and identified by catalog number. The catalog is 14 x 18in. in size and is printed in full color for life-like presentation. It is mounted on heavy cardboard and varnished to withstand soiling. There are two holes at the top of the card so it can be hung with standard pegboard hooks. Vaco.

### Recording Basics 404

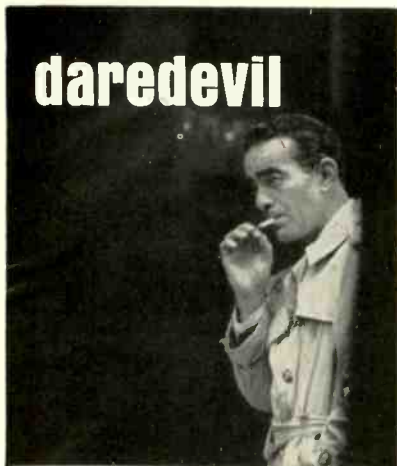
A 24-page guidebook for more effective use and better understanding of magnetic recording tape is offered. Called "Recording Basics," the book contains information on such subjects as the construction and manufacture of recording tape, how to select the right tape for individual requirements and how to figure recording time for the many different tapes. The book also contains a basic explanation of the various recording formats. Illustrative diagrams assist in the explanation of such terms as full-track, dual-track and four-track recording. The new book also contains helpful information on such subjects as splicing, editing, the use of leader and timing tape, recorder maintenance and the care and handling of magnetic recording tape. 3M.

### Sound Column 405

A new sound column booklet is available which features a selection guide making it possible to solve the "which columns?" problem accurately and confidently in 90% of all potential installation situations. It also de-



# daredevil



Doesn't think of himself as the reckless type at all. But he goes on taking the *big* risk. Clings to a habit which causes 100 deaths every day from lung cancer and which contributes to many, many more from coronary artery and respiratory diseases. Studies show that the death rate from lung cancer alone for cigarette smokers (one-pack-a-day or more) is 10 times higher than for nonsmokers.

Nobody says it's easy to stop. But living *that* dangerously often winds up in not living at all.



**american cancer society**

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Rebuild your own CRT's. Average cost B/W \$1.50—Color \$8.50. Easy to operate. Requires only 4x8 feet of space.

Supplies for your first 50 picture tubes free!

Color — black and white. Rebuilt while you are here. See the results for yourself. Terms Available

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## ET/D CATALOGS & BULLETINS

scribes in clear language the theory of sound columns and provides many installation tips and application ideas.

Other new literature includes new catalogs of high fidelity and sound system equipment, special sheets for architectural use, accordion type folders for mailing use on sound columns, "decor/oriented" high fidelity equipment and speech director portable PA systems. Argos.

### Phono Cartridges and Hi Fi Components 406

An eight-page catalog covering phono cartridges as well as other high fidelity stereo cartridges, tone arms, styli and headphone amplifiers is available. Complete specifications and performance information, along with charts and definitions of trackability (the newest method of gauging total performance of cartridges) is provided. The new publication covers the complete cartridge line, including the V-15 Type II "Super-Track" cartridge.

Application data and prices are also given. Shure.

### Communications Equipment 407

A 98-page catalog No. 1068 relating to wire, cable, CCTV, CATV, ETV hardware and miscellaneous lines of equipment necessary to the communications industry is published. A newly introduced series of Futura amplifiers covering both 12 and 21 Plus channel capability, including trunk line amplifier modules, bridger modules, power supply modules and AGC modules is included. Vikoa.

### Sound Products 408

An all-new high fidelity sound products catalog, No. 165-P is now available. Illustrated in color, catalog shows new speakers in highly styled furniture systems designed to complement any room decor—and all provide complete and distortion-free reproduction of the sound spectrum. Also illustrated and described is the line of coaxial and triaxial speakers plus the complete series of high fidelity component speakers and accessories. Jensen.

### Soldering Tools 409

Newly expanded, comprehensive literature details vary and benefits of temperature-controlled production soldering tools. A complete cataloging of these tools and a broad loosening of selectable temperature sensing tests are included. The line of tools is suitable for most industrial electronics soldering application. Weller.



**Put this E-V needle/cartridge display next to your cash register ...it insures good fortune!**

Put this handsome merchandiser with its stock of E-V literature on your counter. You've just taken the first step toward bigger phono needle & cartridge sales.

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# MAKE YOUR OWN TUNER TEST!

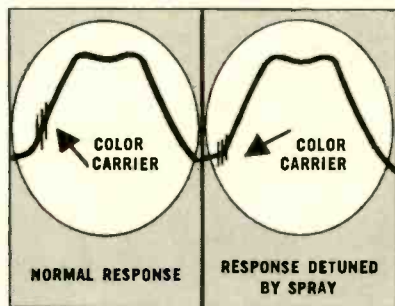
If you're like most professional TV technicians, you clean the tuner of every chassis you service.

But how careful are you in choosing your tuner spray? The wrong spray can cost you a lot in aggravation and callbacks.

That's why we ask you to

## MAKE THIS TEST YOURSELF

1. Tune in a good color picture on any color set.
2. Spray the tuner with anything but a Chemtronics Spray.
3. You will see the color fade and disappear almost immediately, due to the changes of capacitance in tuned circuits caused by the spray.



4. Wait about 10 minutes for the spray to dry. Unfortunately, the color will not come back.
5. Spray the tuner with Chemtronics TUN-O-WASH.
6. Wait about two minutes and color will be restored.

## WHAT THIS TEST MEANS TO YOU

Most tuner sprays leave a residue of slow drying, petroleum base lubricant. This saturates the coils and other components causing a shift in response as shown in illustration.

To compensate for this shift, you often adjust oscillator slugs. Then, when the set has played in your customer's house for a week or two, the residue dries out, shifting the oscillator back toward its original frequency. If the customer can't compensate for this drift with the fine tuner, you have a callback on your hands. Even if the drift is not too severe, the remaining residue picks up dirt and eventually "gunks up" the tuner.

## TUN-O-WASH IS LIKE NO OTHER SPRAY ON THE MARKET

TUN-O-WASH is a powerful, high pressure spray designed to do just one job superlatively well. It melts away grease, oil, dirt and corrosion quickly and completely. It leaves absolutely no residue behind. Tests show that TUN-O-WASH is at least 10 times as effective as any other tuner spray in degreasing gunked up tuners.

Use TUN-O-WASH as your first step in repairing any tuner. It gives you a clean start in much the same way as the ultrasonic bath used by tuner specialists — but without harmful vibration. You'll be surprised at how many tuners you can repair the TUN-O-WASH way.

Then, once the tuner is restored to good working condition, you can lubricate it with a light spray of Chemtronics famous COLOR-LUBE, guaranteed not to detune, attack plastic parts or "gunk up." COLOR LUBE uses a unique synthetic lubricating formula developed specifically for color TV tuners.



Giant 24 oz. can only \$3.25 dealer net.

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Lampkin pioneered the PEAK voltmeter for FM modulation indication.

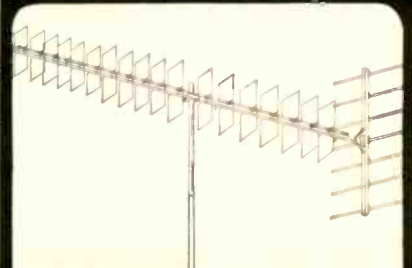
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## Revolutionary MODEL UPW UHF PASSIVE WAVE ANTENNA

This system in which there are no electrical connections,

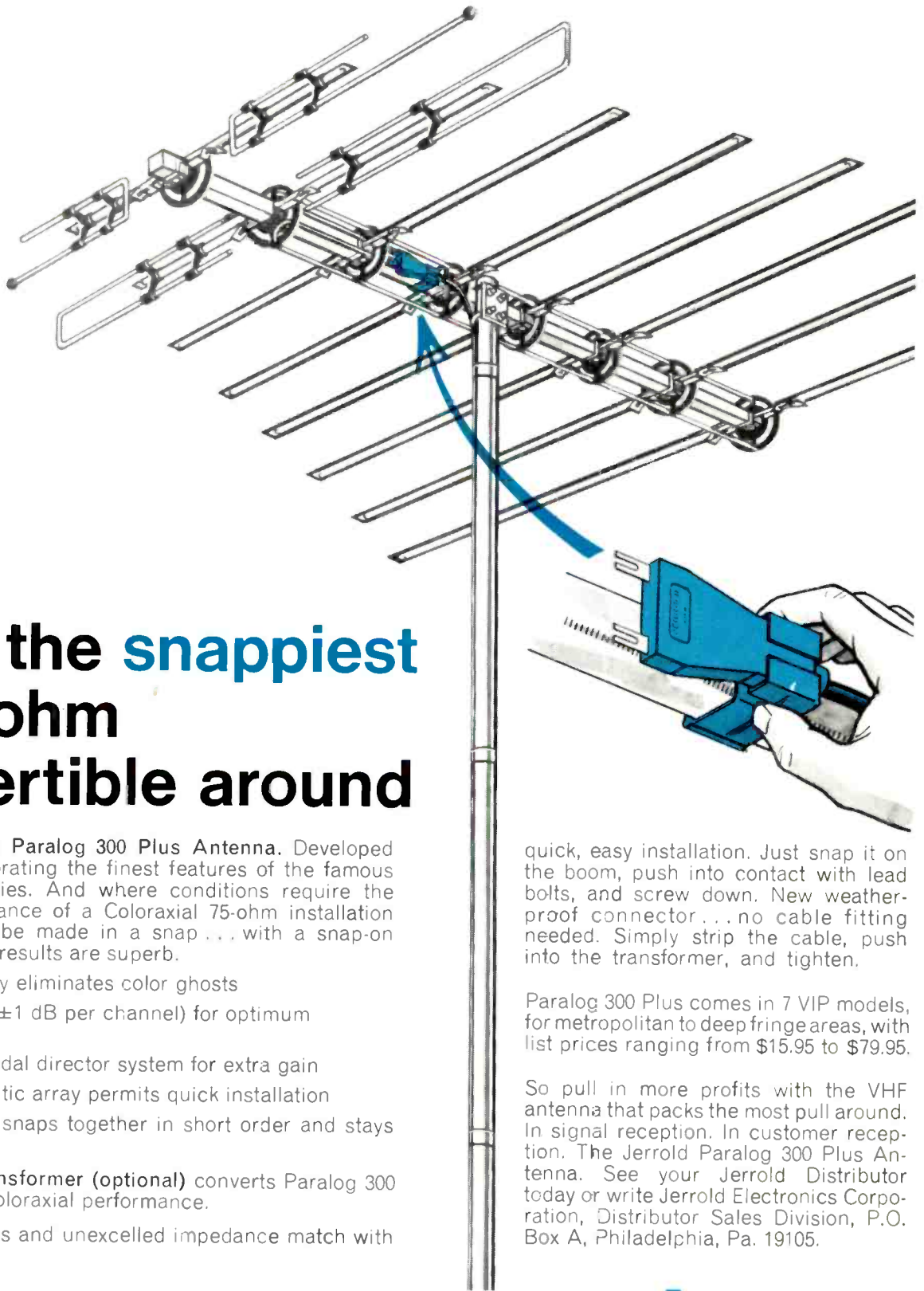
**PROVIDES HIGH GAIN ACROSS THE ENTIRE UHF BAND**

and eliminates noise caused by loose elements at high frequencies. High overall gain across the entire UHF band makes this antenna more desirable than any frequency conscious yagi types being marketed today. Excellent color reception assured. More gain than a Parabolic. Top quality construction.

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The New Jerrold Paralog 300 Plus Antenna. Developed from and incorporating the finest features of the famous Paralog Plus series. And where conditions require the superior performance of a Coloraxial 75-ohm installation the change can be made in a snap... with a snap-on transformer. The results are superb.

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- Exclusive bi-modal director system for extra gain
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Paralog 300 Plus snaps together in short order and stays together.

New snap-on transformer (optional) converts Paralog 300 Plus to 75-ohm Coloraxial performance.

Combines low loss and unexcelled impedance match with

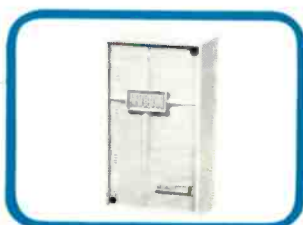
quick, easy installation. Just snap it on the boom, push into contact with lead bolts, and screw down. New weather-proof connector... no cable fitting needed. Simply strip the cable, push into the transformer, and tighten.

Paralog 300 Plus comes in 7 VIP models, for metropolitan to deep fringe areas, with list prices ranging from \$15.95 to \$79.95.

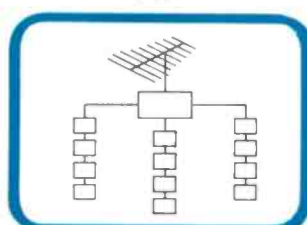
So pull in more profits with the VHF antenna that packs the most pull around. In signal reception. In customer reception. The Jerrold Paralog 300 Plus Antenna. See your Jerrold Distributor today or write Jerrold Electronics Corporation, Distributor Sales Division, P.O. Box A, Philadelphia, Pa. 19105.



Home preamplifiers



Home Distribution Systems



MATV Systems



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a GENERAL INSTRUMENT company

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Trimmed in gleaming brass, this good looking 13 1/4" x 18 1/4" clock with RCA's new look will be a real asset to your store.



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Eye catching decals to put in windows, on walls or caddies, give you professional RCA product identification.



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Basic collection of 12 small tools especially selected to service miniaturized circuits . . . . a great help in servicing transistorized equipment.

