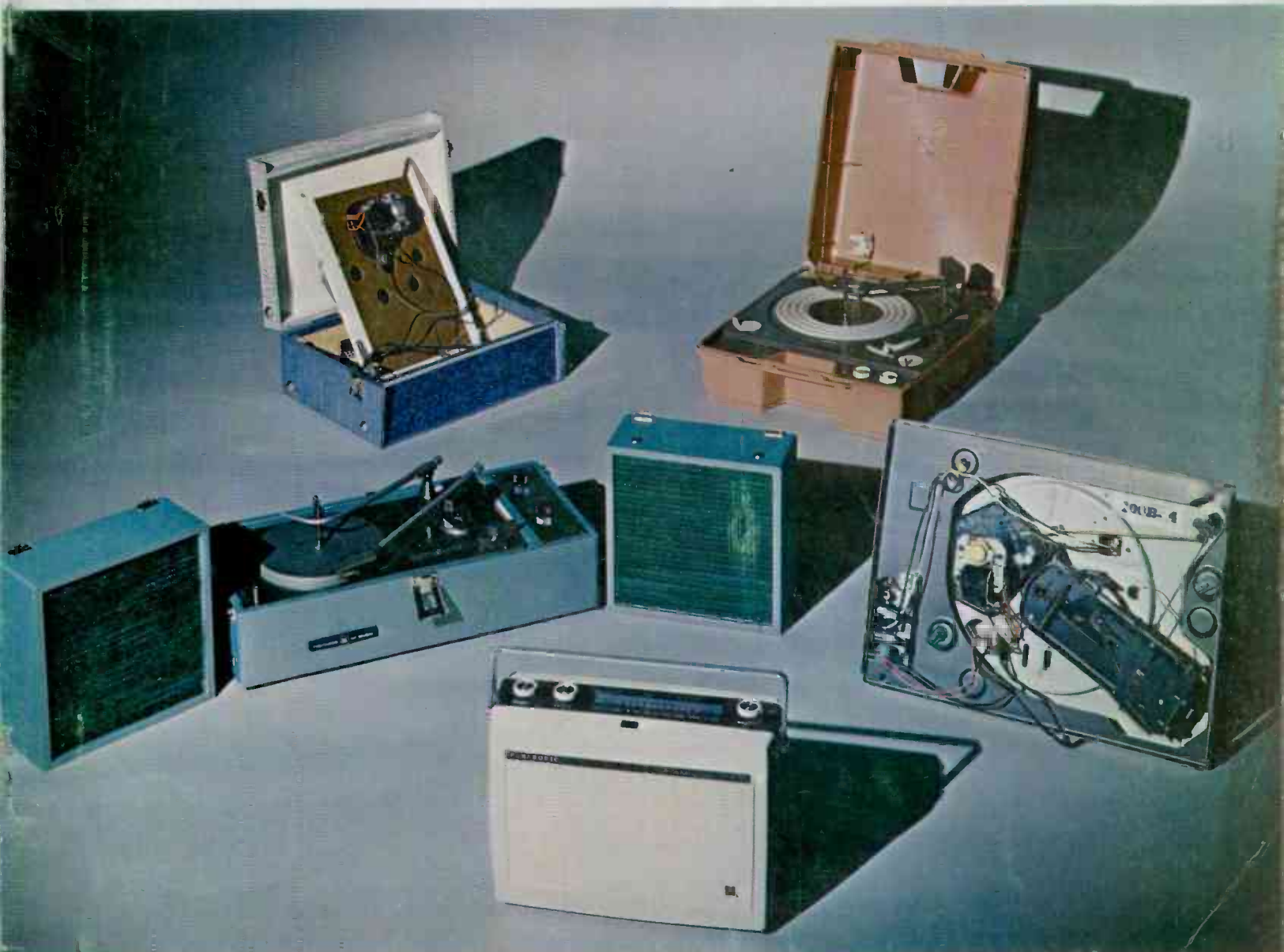


Senior Test Equipment

PF Reporter™

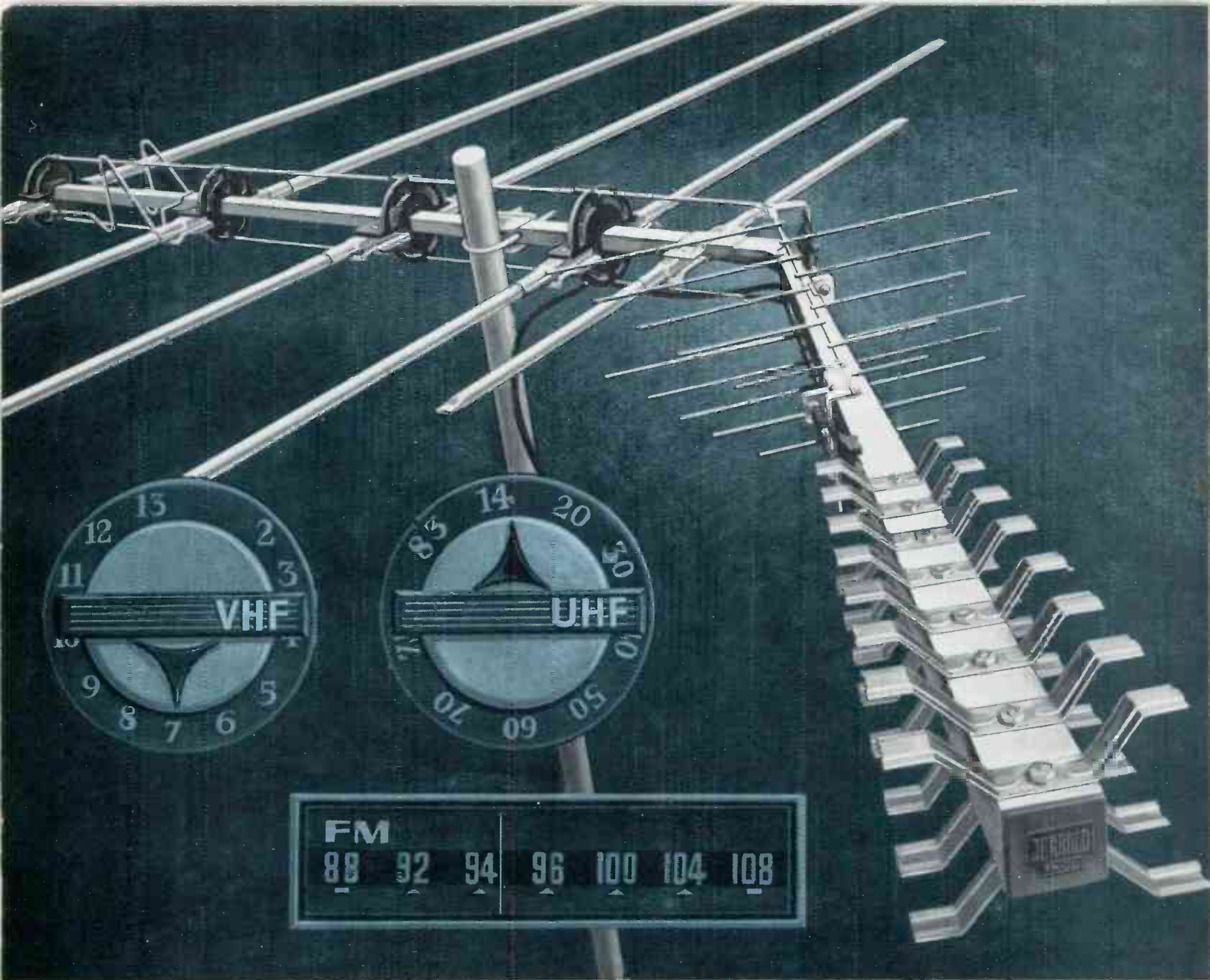
PHOTOFACT

the magazine of electronic servicing



SAUEL SACHS
 2244 NORTH 10TH ST.
 PHILADELPHIA, PA. 19133
 PA 50 3879 558

- 5-Year Subject Reference Index
- Repairing the Small Record Player
- Square-Wave Tests of 3-T Networks
- Lasers You May Encounter
- One Component—Many Symptoms
- Plus other servicing features



NOW...FIRST ALL-CHANNEL ANTENNA WITH INDIVIDUAL UHF and VHF ORIENTATION, 75- OR 300-OHM OUTPUT

New JERROLD Coloraxial *Pathfinder*TM

Here's *the* antenna to answer every VHF, UHF, and FM reception need from metropolitan to deep-fringe areas... Jerrold's new Coloraxial PATHFINDER.

The new PATHFINDER (Series PAB and PXB) is a unique combination—a cascaded-periodic VHF antenna plus an advanced-design UHF section, all in one pre-assembled unit. Both 75-ohm Coloraxial and 300-ohm models for every taste and budget. And look at the prices—as low as \$21.95!



VHF and UHF sections may be individually oriented for maximum directivity. While you get all the flexibility of separate VHF

and UHF antennas, PATHFINDER eliminates the splitters (with their inherent losses) needed to couple separate antennas with a common downlead.

Take advantage of the growing UHF and FM stereo markets by selling this all-purpose high-gain antenna. Rugged square-boom construction and Golden Armor corrosion-resistant finish assure long life. Flat response across entire band (channels 2-83), low VSWR, excellent front-to-back ratio make PATHFINDER a "natural" for easy sales and satisfied customers. Talk to your Jerrold distributor today, or write for complete information. *Jerrold Electronics Corporation, Distributor Sales Division, 15th & Lehigh Ave., Philadelphia, Pa. 19132.*

Circle 1 on literature card

5-YEAR Subject Reference INDEX

1961-1965

An index to article titles, categorized by subject, is included at the end of the main index.

AFC

Balanced dual diode	66 Dec '61
.....	29 Jun '63
.....	25 Nov '63
Common cathode	36 Aug '63
.....	25 Nov '63
.....	6 Jan '65
Horizontal	
—synchroguide	32 Apr '64
—transistor circuits	3 Jun '64
RF	
—defeat switch	72 Feb '64
—FM servicing chart	74 Feb '64
Triode	69 Aug '63
Troubleshooting	6 Jan '65

AGC

Analyzing typical stage	98 Nov '63
Auto radio	58 Jan '65
Bias substitution box	44 May '63
Blanking bar to locate faults	54 Aug '65
Chart for troubleshooting	78 Apr '65
Checking with VTVM	29 Mar '64
Clamping	44 May '63
.....	58 Jul '63
Cut off, no signal	30 Feb '63
Delay resistor changes value	54 Jan '64
Filter and distribution paths	31 Aug '65
Filter defective	37 Apr '63
.....	5, 6 Jul '63
Filter time constants	50 Jul '61
Filter troubles	32 Aug '65
Fullwave doubler system	58 Jan '65
Halfwave system	58 Jan '65
Intermittent component in	52 Jan '64
Keyed, trouble during	
warm up	20 Jan '62
Keyed type	28 Sep '64
Keying tube fails repeatedly	74 Oct '61
Limitations of	28 Sep '64
Peak type	91 Sep '64
Simple circuits	29 Sep '64
Transistor circuits	7 Jun '64
Transistor leaky in auto radio	42 Jun '65
Troubleshooting	
—auto radio	58 Jan '65
—TV	31 Aug '65
—tips	33 Apr '65
Video missing, faint buzz	30 Feb '63
Voltage chart for locating	

trouble

ALIGNMENT

AM IF	32 Feb '65
AM radio	58 Jul '64
Bias supply for	58 Jul '63
CB	30 May '65
Chroma and demodulator	66 May '63
Chroma bandpass	115 Nov '65
Chroma bandpass amplifier	71 Jan '63
Chroma demodulator	62 Feb '63
.....	64 Mar '63
Color accessories for	44 Aug '64
Color TV, overall	47 Nov '65
High voltage regulator	65 May '65
Instrument setup	72 Oct '65
Modulation CB, checking	81 May '65
Multiband receivers	34 Dec '63
Oscillator (disabling)	66 Jul '63
Painless TV alignment	32 Oct '61
Procedure to follow for TV	73 Oct '65
Receiver, communications	7 Apr '64
Special tools for	38 Oct '62
Stereo FM	32, 92 Mar '63
.....	64 Apr '63
.....	67 Sep '63
.....	76 Oct '63
.....	78 Nov '63
Sweep scope control settings	35 Mar '63
—for FM	78 Nov '63
—in TV	78 Mar '63
TV remotes	99 Nov '63
Test equipment for color	47 Nov '65
Tools for transistor sets	35 Jun '65
Transistor portables	36 Feb '63
Transmitter	67 Apr '63
—high frequency	32 Feb '63
Transmitter, communication	4 Apr '63
Trap misadjustment in	
color set	30 Nov '65
.....	47 Nov '65
Two-way radio	1 Apr '64
VSM (video-sweep	
modulated)	114 Nov '65
Video IF	30 Sep '62
.....	48 Nov '65
Waveforms for sweep	28 Jan '65

ANTENNAS

Adjusting two or more	26 Jul '65
Amplifier	

—circuits	44 Apr '65
—troubleshooting	46 Apr '65
Amplifiers for	33 Aug '64
Auto radio type	52 Apr '63
Blow-down, avoiding	27 Jul '65
Boosters and preamps,	
repairing	44 Apr '65
Cable plugs, soldering	40 Apr '63
Cable runs through walls	29 Aug '62
Cables, splicing	12 Aug '63
Chimney mount, strapless	38 Aug '61
Communications-radio types	22 Jul '61
Communications types	48 Apr '63
—guide to	76 Apr '64
Conductor separation	39 Aug '64
Couplers for	32 Aug '64
Defective installation,	
correcting	30 Feb '62
Defects in home	
installations	45 Dec '61
Design principle	56 Apr '63
Dipole for field-strength	
measurements	72 Jun '63
Directory of manufacturers	30 Aug '62
Distribution systems, for	33 Aug '64
Dummy-type	54 Feb '64
Equipment approval	39 Aug '64
Failures, spotting	31 Jul '65
Field-strength meter use	44 Apr '63
.....	72 Jun '63
Fringe area installation	28 Jul '65
Grounding practices	39 Aug '64
Grounding, proper procedure	13 Feb '64
Horizontal stacks	25 Jul '65
Indoor types	
—TV and FM	74 Aug '64
—UHF	74 Oct '64
Installation and replacement	44 Dec '61
Installation codes and laws	39 Feb '61
Installation, transmission-	
line	48 May '62
Lead-in types of	40 Feb '61
Lead-in wire for	20 Feb '64
Lightning arrestors	39 Aug '64
Light-weight communications	
type	62 Jul '64
Log periodic	68 Jul '63
.....	73 Aug '64
Maintenance of	30 Jul '65
Master antenna systems	28 Aug '62
Master system operations	30 Aug '64

Mounting hardware	40 Feb '61
Multiple-outlet home installation	31 Feb '62
Multiple systems, phasing	24 Jul '65
National Electrical Code, as applied to	39 Aug '64
Pads vs matching transformers	94 Oct '65
Polar graphs	38 Feb '61
Preamplifiers, mast mounted	34 Apr '62
Preamplifiers	44 Apr '65
Promotion, repair-business	56 Nov '61
Response curve, checking	44 Apr '63
Rotator control box	42 Oct '61
Rotators	24 Aug '62
SWR in two-way	40 Mar '64
SWR meter	54 Feb '64
Safety	39 Aug '64
—during installation	56 Sep '64
Safety precautions when installing	13 Feb '65
Sales techniques	56 Aug '64
Stereo FM	48 Aug '65
Stereo FM antenna requirements	34 Aug '62
Systems, multiple	24 Jul '65
Troubleshooting	44 Apr '63
UHF	46 Oct '63
UHF, indoor types	48 Oct '63
UHF installations to receive MPATI airborne TV	36 Oct '61
UHF types	62 Jan '64
—log-periodic	69 Apr '64
—TV	71 Apr '64
VHF preamplifier, mast-mounted	46 Sep '61
Vertical stacking	26 Jul '65
Wall-outlet system kit	42 May '61
Windload effects, overcoming	27 Jul '65
Yagi, dual element	83 Jul '65

AUDIO SYSTEMS

See also *SOUND SECTION, TV*

ASCAP and BMI music licensing	18 Apr '62
Acoustics, measuring	36 Aug '65
Amplifier defects	3 Aug '65
Amplifier output power needed for various room sizes	33 May '62
Amplifiers	2 Aug '65
Amplifiers, high-power	83 Sep '63
—measurements	80 Oct '63
Attenuators, types of	32 Oct '65
Audio signal generator	26 Sep '61
Background-music systems	28 Feb '62
Booster amplifier for	73 Aug '64
Buzz, caused by tube socket leakage	44 Jan '65
Buzz and hum in	27 Jan '65
Commercial sound	
—amplifiers	23 Jun '61
—intercom-system installation	34 Oct '61
—table of power-output and speaker requirements for various jobs	62 Jun '61
Component hi-fi systems	32 May '62
Constant-voltage lines	58 Oct '63
Crystal headphones hooked up to audio output of TV	70 Sep '61
Custom stereo types	56 May '64
Distortion in	38 Sep '64
Distortion problems	52 Mar '65
Distortion tests	32 Aug '62
FM stereo circuit features and service hints	38 Dec '61
Filter buzz	44 Jan '65
Frequency response,	

measuring	50 Mar '65
Gain, measuring	56 Mar '65
Ground loops in components or systems	42 Jan '62
Harmonic distortion	52 Mar '65
Harmonic-distortion meter	27 Sep '61
High-level circuit	6 Aug '65
Hum elimination	42 Jan '62
Hum in	62 May '64
Hum in phono after 15 minutes	76 Jan '61
IM distortion in	80 Mar '64
Interference, scope analysis to locate	27 Jan '65
Intermodulation-distortion analyzer	76 Sep '61
Jacks, compact audio	78 Jun '64
Low-level circuits	2 Aug '65
Medium-level circuits	4 Aug '65
Output power, measuring	54 Mar '65
Output transformerless circuits	6 Aug '65
Output tube gassy	44 Jan '65
Paraphase amplifier	5 Aug '65
Phase distortion	2 Aug '65
Phono and tape recorder cleaning	29 Aug '65
Phono-needle selection and installation	38 Oct '61
Power computed from voltage across load (chart)	26 Sep '61
Preamplifiers	32 Sep '63
Public-address system	
—interference from police radio	72 Mar '62
—noise suppression in church installation	80 Sep '62
—overdriven by speaker's voice	78 Dec '62
Push-pull output	5 Aug '65
Radio-signal pickup on speaker wiring	56 Mar '61
Record changer servicing	1 Aug '63
Reverberation systems in '61 hi-fi	38 Jan '61
Ripple waveforms, normal and abnormal	26 Jan '65
Scratch filter	68 Jan '63
Sound-level measurements in db	72 Dec '62
Speaker connections	64 Aug '63
Speaker installation in	56 May '64
Speaker phasing	62 Feb '62
Speaker requirements for various applications	27 May '61
Speaker systems	82 May '62
Tape recorders	
—electronic troubles	52 Mar '61
—operating difficulties of owners	46 Mar '61
—record-level indicator failure	70 Sep '61
—sales and service	38 Apr '62
—treble response	60 May '61
Test recordings	73 Aug '63
Tests and measurements	50 Mar '65
Troubleshooting	1 Aug '65
VTVM for audio work	26 Sep '61
Wow and flutter checks	77 Sep '61

AUTOMATIC TV TUNING

See *REMOTE CONTROL TV*

AUTO RADIOS

AGC circuits	58 Jan '65
AM-FM sets	26 Jul '63

Antennas	52 Apr '63
Antenna trimmer adjustment	32 Feb '65
Batteries weak	42 Jun '65
Battery-polarity change on 12-volt vibrator type	74 Oct '61
Driver stage trouble due to defective tube socket	69 Feb '62
Driver-stage trouble in hybrid type	84 Dec '61
Duplication operating conditions in servicing	
FM sets, reception problems	69 Jul '63
Fader control circuits for dual speakers	44 Jun '61
Flashing generator field	78 May '62
Front end, checking	60 Apr '65
Fusible resistor in output stage	14 Oct '64
Hum elimination during bench servicing	37 Dec '61
Hybrid	
—troubleshooting	56 Apr '65
Interference to FM types installed in Fords	55 Jun '61
Oscillation, cause of	60 Jan '65
Oscillator	
—checks	43 Jun '65
—defects	60 Apr '65
—slug adjustment	83 Feb '65
Output transistor failures	40 Jun '61
Power supply	62 Apr '64
Rear seat speaker	
—installation, general	68 Aug '64
Search tuning systems	22 Jul '62
Specialization in	34 Apr '64
Stereo adapter for	15 Nov '64
Strong signal distortion	58 Jan '65
Test equipment for	38 Mar '63
Transistorized	24 Mar '62
Voltage readings, in AGC circuits	58 Jan '65

BATTERIES

Charging, nickel-cadmium types	54 Apr '63
Converter/charger	64 Aug '64
Eliminator for VTVM	60 Jul '64
Measuring voltages in mobiles	44 Mar '64
Rechargeable type	69 Apr '64
Replacement guide	52 Jun '63
Transistor radios, for	79 Jun '64
Voltage-reference source	12 Nov '62

BOOK REVIEWS

Acoustical Tests and Measurements	60 Jul '65
Basic Theory and Application of Transistors	51 May '65
Communication Satellites	47 Sep '64
Color TV Troubleshooting Pict-O-Guide	117 Nov '64
Electronic Volt Meters	88 Sep '65
Handbook for Electronic Engineers and Technicians	45 Dec '65
Handbook of Electronic Tables and Formulas, 2nd edition	78 Oct '64
How To Make More Money In Your TV Service Business	83 Apr '65
How to Service UHF TV	119 Nov '65
Mathematics for Electronics and Electricity	44 Dec '64
Radio and Television Receiver Circuitry and Operation	66 Jun '65
Servicing Garage Door	

Opener	87 Mar '65	Demonstrations, use of		Salaries	54 Apr '64
Transistor AF and RF		in sales	61 Aug '64	Sales, breakdown charts	48 Feb '64
Circuits	71 Jun '65	Depreciation	46 Feb '63	School courses for advanced	
Two-Way Mobile Radio			76 Mar '63	technical training	54 Feb '61
Handbook	66 Oct '64	Diversification of		Selling service	18 Jul '63
BOOST		service business	54 Feb '61	Service-call cost, determining	70 Apr '62
Blooming and HV loss	36 May '64	Diversified service		Service charges	
Checking procedure	82 May '64	organization	36 May '62	—explaining to customers	44 Dec '62
Focus, effect on	26 Jan '63	Efficiency, increasing	50 Jan '62	—for color—TV work	50 Nov '62
Voltage, low	69 Jan '65	Electronic servicing,		—for two-way radio	26 Jun '62
Voltage measurement	40 May '61	future of	21 May '65	Service-truck leasing	44 Oct '61
	32 Aug '61		36 Apr '65	Shop facilities	58 Jun '63
Weak	36 May '64	Employee theft	42 Jul '64	Shop-layout suggestions	56 Jan '62
BUSINESS		Estimates	46 Dec '63	Shop, starting	40 Nov '63
Advertising	60 Jun '63	—charges for	46 Dec '62	Sound-system leasing	
Advertising program for		—on repairing transistor		and rental	38 Sep '61
service shops	67 Jan '62	portables	48 Mar '62	Specialization	34 Apr '64
Advertising promotions for		Expansion of service		Tax problems	38 Feb '63
slack season	30 Jul '62	business into sales	46 May '61	Telephone etiquette	86 Nov '63
AM-FM Transistor repair,		Expenses	50 Apr '64	Test equipment, choosing	
fees for	34 Oct '65	FCC rules on CB	44 May '65	instruments for shop	26 Apr '61
Antennas and towers, selling		Federal income tax	42 Feb '62	Test equipment, costs	74 Mar '63
and servicing	31 Jul '65	Fees charged by typical		TV sales	49 Oct '65
Antenna repair, promoting	56 Nov '61	TV shops	40 Dec '61	Tax deduction and	
Audio rental, leasing,		Financing	46 Nov '63	depreciation	50 Oct '64
and sales	24 Aug '65	Finance companies as source		Technician	
Audio servicing		of customer credit	42 May '62	—appearance	15 Nov '65
considerations	72 Sep '64	Flat-rate charge	42 Dec '62	—hiring	30 Sep '65
Books for improving	52 Jan '65	Guaranteeing service work	58 May '63	Techniques for selling	
Budgeting	74 Mar '63	Hiring employees	64 Sep '63	antennas	56 Aug '64
Burglary, protecting shop		Home-call sales by		Test equipment, advantage	
against	62 Dec '61	servicemen	40 Jul '61	of quality	50 Mar '64
Call backs, general hints		Importers and manufacturers		Test equipment	
for reducing	52 Apr '62	of transistor radios	25 Jan '62	—specialized servicing	36 Mar '65
Call backs, preventing	18 Jul '63	Income tax	38 Feb '63	—trading old for new	93 Mar '65
CATV, as new line	12 May '65	Insurance	52 Oct '64	Training programs for	
CATV, effects on service			68 Jan '64	technicians	30 Sep '65
shops	42 Feb '65	Inventory-control systems		Transistor servicing	32 Jun '64
CB rules, new	62 Jan '65	for shop	20 Mar '61	Two-way radio, using	50 Jan '63
CB-TV1 problems	68 May '65	Inventory, expanding		Unclaimed merchandise, disposal	
Charge-plan associations	40 May '62	where needed	46 Nov '62	by service shops	56 Dec '61
Citizen band sales and		Inventory for color caddie	88 Nov '63	Vehicle-rental firms, national	48 Oct '61
service opportunities	30 May '61	Inventory records	42 Nov '62	While-you-wait service	55 Jun '63
	64 Jan '65	License, FCC second-class	22 Sep '61	CCTV	
Choosing new lines	44 Jun '64	Management for profit	48 Apr '64	Color	36 Nov '63
Collection efforts by		Microwave servicing as		Industry, for	74 Nov '63
service dealers	58 Jun '62	new field	41 Mar '65	Progres of	30 Oct '62
Color TV questions		Modern methods	44 Jan '64	Schools, in	48 Jan '63
and answers	66 Nov '64	National Electrical Code	39 Aug '64	CABLE TV	
Color servicing, net		Office	3 Jan '64	Affects receiver servicing	40 Jul '63
profit picture	45 Nov '65	One-man shop (humorous)	62 Oct '63	Affects servicemen	36 Jul '63
Color servicing, starting	58 Nov '63	Overhead expenses		Effect on independent	
Color-TV service business,		categorized	66 Apr '62	servicemen	42 Feb '65
how to enter	48 Aug '62	Overhead, list of typical			12 May '65
Color-TV service promotion	54 Nov '61	items	40 Aug '61	Growth of	42 Feb '65
Communications-radio		PA systems	54 Oct '63	Questions and answers	
servicing, prices		Peaks and slumps, smoothing	26 Apr '63	concerning	42 Feb '65
charged for	26 Jun '62	Phone conversations,		System descriptions	42 Jul '65
Competing with drug store		recording of	14 Jun '64	CAPACITORS	
tube testers	62 Oct '62	Phono-tape repair charges	54 Aug '63	Ceramic type	38 Apr '64
Costs involved in operating		PL statement, sample	48 Apr '64	Charge vs discharge time	31 Aug '65
TV shop	66 Apr '62	Pricing	62 May '63	Comparative cost chart	38 Apr '64
Credit applications,			56 Jun '63	Electrolytic defects causing	
evaluating	58 Jun '62	Printed forms for		raster distortion	32 Apr '62
Credit, handling	48 Aug '63	service shops	36 Jun '61	Electrolytics, square-wave	
Customers,		Profit-and-loss statement	66 Apr '62	testing	36 Jul '65
—getting new ones	50 Nov '63	Promotion	60 Jun '63	Facts about	36 Apr '64
—handling	15 Nov '65	Promotion, sales	61 Aug '64	Feed-through	50 Aug '61
	21 Feb '61	Protection against fraud	66 May '64	Glass type	38 Apr '64
—relations	18 Jul '63	Radio amateurs, relations		High-voltage types	62 Jul '65
	67 Aug '63	with	78 Sep '64	Inside IF cans,	
Customer record file,		Radar		replacements for	87 Dec '61
uses for	38 Sep '62	—finding customers	39 Feb '65	Intermittent shorts or opens,	
Customer relations		—maintenance	38 Apr '65	value changes	50 Jan '64
—old sets, owners of	36 Oct '63	Receivables insurance	47 May '62	Leakage test with	
—on telephone	86 Nov '63	Recording local performances			
Deductions, tax	44 Feb '63	for profit	38 Apr '62		
		Records, analyzing	46 Feb '64		

square wave	31 Oct '65
Metalized-paper type	36 Apr '64
Mica type	37 Apr '64
Open test with square wave	31 Oct '65
Paper-tubular type	36 Apr '64
Paralleling	62 Jul '65
Plastic-film type	37 Apr '64
Principles of electrolytics	38 Feb '64
RC circuits, square-wave testing	33 Aug '65
Replacement and test methods	28 Aug '61
Replacement technique, electrolytics	34 Sep '63
Ringing test for	37 Jul '65
Silvered mica	37 Apr '64
Square-wave testing of	36 Jul '65
Substituter	58 Feb '64
Temperature-compensating types	58 Feb '62
Testing of filter types	42 Feb '64
Transistorized circuitry, for	37 Jul '65
Transistor radios, for	52 Sep '63
	37 Feb '63
Tuned circuit	83 Feb '65
Varactors	74 Sep '65
Voltage-variable	74 Sep '63

CAPACITOR TESTERS

B & K Model 801	39 Aug '65
Bridge, comparator	92 Mar '64
Cornell-Dubilier VF-71A analyzer	58 Oct '64
Decade	86 Mar '64
Direct-reading meter	44 Feb '64
EICO Model 955	72 Oct '62
EICO Model 965	54 Oct '65
General information	64 Aug '61
In-circuit tester	44 Feb '64
Mercury Model 1400	39 Jul '65
Ohmmeter as	44 Feb '64
Sensitivity, increasing	44 Mar '63
Sprague Model TCA-1	48 Jun '61
Sprague Model TO-6	74 May '65
Substitution type	58 Feb '64

CARTRIDGES (PHONO)

Needle replacement	32 Aug '63
Needles	75 Aug '63
Structure	22 Aug '63
Tracking pressure, measuring	76 Aug '63
Troubleshooting	22 Aug '63

CHEMICALS

Adhesives	
—use in servicing	52 May '65
Aerosols	36 Jul '64
Carbon tet, dangerous	13 Oct '65
Effective use in servicing	30 May '62
Furniture polish for cabinets, aerosol foam type	83 Dec '61
Liquid used in repairing broken CRT lead	64 Dec '62
Lubricating solvent	36 Jul '64
Plastic repair compound	54 May '64
Precautions in using	38 Jul '64

CITIZENS BAND

Accessories for	58 Feb '65
Alignment	30 May '65
Antennas	48 Apr '63
Business application	64 Jan '65
CONELRAD alarm for stations	58 May '61
Crystals	84 Feb '65
Current drain, checking	60 May '65

Customers, finding and keeping	60 Feb '65
Equipment display	58 Feb '65
FCC, how it affects	44 May '65
Frequency meter for	70 Apr '64
Frequency-synthesized transceiver	63 Jul '64
Future of	62 Jan '65
Industrial communications in	98 Apr '64
Industrial sales	104 Apr '64
Interference on TV	14 May '62
	68 May '65
Mobile unit installation	32 May '65
Modulation checks	81 May '65
New rules	62 Jan '65
Noise clipper, Seco Model 530	78 Jan '63
Petitions to FCC	18 Sep '65
RF circuits in	82 Sep '65
Radiotelephones	69 Apr '64
—transistorized	63 Jul '64
Receiver alignment	50 Jun '62
Rule changes	44 May '65
Rules governing service	65 Jan '65
Sales and service	58 Feb '65
Selective calling	74 Jul '64
Service business, using in	50 Jan '63
Service dealer and the market	30 May '61
Service policies	62 Feb '65
Station classes and channels	98 Apr '64
Test equipment for	38 Mar '63
Tester, all-purpose	67 Apr '63
Transmitter and antenna tester	54 Feb '64

COILS

See also *TRANSFORMERS AND COILS*

DC resistance	35 Apr '65
Distributed capacitance	35 Apr '65
Installation hints	81 Apr '65
Low-Q	50 Jun '65
Oscillator, TV	12 Jul '64
Properties of	34 Apr '65
Skin effect	35 Apr '65
Square-wave testing	50 Jun '65
Types of	34 Apr '65

COLOR COUNTERMEASURES

Admiral 25E6	
—loss of focus	84 Nov '63
—multiple ghosts	84 Nov '63
—brightness insufficient	79 May '65
	75 Sep '65
Color bars damage CRT	66 Mar '65
Color picture drifts	79 May '65
Picture tube difficulties	70 Nov '64
RCA CTC9, raster blooms	60 Jul '63
RCA CTC10, 11, raster shrinks	72 Apr '63
RCA CTC11, raster off-center	70 Feb '63
RCA CTC12	
—color sync lost	86 Nov '63
—misconvergence	68 Jan '63
—overloaded picture	86 Nov '63
Zenith 25LC, 26KC, 27KC, 29JC, unable to center raster	86 Nov '63
Zenith 25LC20, 25LC30, 25MC30, impurity at outer edge of raster	76 Nov '64
Zenith 25LC20, 25LC30, 25MC30, S-hook or bend at top of raster	74 Nov '64
Zenith 26KC20, 25LC20, 25LC30, blooming and	

poor focus	81 Jul '65
Zenith 26KC20, 25LC20, 25LC30, 25MC30, 25MC33, circuit breaker kicks out	70 Nov '64
Zenith 27KC20, brightness uncontrollable	66 Aug '65
Zenith 27KC20, 29JC20	
—focus intermittent	78 Mar '63
—high voltage corona	76 May '63
—hue control inoperative	66 Aug '63
Zenith 29JC20	
—color loss	87 Nov '63
—weak color	56 Jan '65
Zenith 29JC20, 27KC20, 26KC20, 25LC20, purity errors and lack of convergence control	72 Nov '64
Zenith 29JC20, 26KC20, 25LC20, 25LC30, 25MC30, vertical sync poor	74 Nov '64
Zenith receivers	
—b-w picture precedes color	77 Apr '65
—erratic CRT bias, misregistration of b-w	72 Nov '64
—no high voltage, tubes check okay	76 Nov '64
—raster missing, high voltage weak	77 Apr '64

COLOR GENERATORS

B & K Model 850	60 Mar '63
B & K Model 1074 TV Analyst	82 Sep '64
B & K Model 1076	44 Jul '61
B & K Model 1240	62 Mar '65
Bar and dot	70 May '64
Checking phase of	32 Nov '64
Color-bar and rainbow types	31 Nov '61
Demodulator operation, for checking	39 Mar '65
Heath Model IG-62	70 May '64
Hickok Model 656XC	68 Oct '62
Hickok Model 661	58 Feb '63
Hints for using	52 May '64
Hue, checking in	38 Mar '65
Jackson Model 800	64 May '63
Lectrotech Model V7	54 Apr '65
NTSC single bar	12 Jul '64
Paco Model G36	73 Jan '65
Patterns produced, typical	38 Mar '65
Precision Apparatus Model E-450	72 Sep '62
RCA Model WR-64A	60 Sep '61
Scope patterns produced by	39 Mar '65
Seco Model 980	55 Jun '65
SENCORE Model CA-122	62 Jun '63
SENCORE Model CG135	40 Jul '65
Use of	38 Mar '65
Vectorscope	77 Oct '64

COLOR TV

1964 circuits	1 Nov '63
1965 circuits	1 Nov '64
1966 circuits	1 Nov '65
ADG circuit analysis	50 Sep '65
Alignment	
Alignment accessories	44 Aug '64
Analyzer	78 Jun '64
Automatic chroma control (ACC)	26 Nov '61
Automatic color control (Zenith)	40 Sep '63
Automatic degaussing circuits	48 Sep '65
Background-control adjustment	34 Sep '65

Bandpass amplifier	4 Nov '63	Doubly-balanced modulator	3 Nov '61	servicing	41 Jul '65
—circuit explanation	32 Jan '63	Extensions for bench setup	98 Nov '62	Picture tube, 21FBP22 or	
—circuits	2 Nov '65	Focus		21FJP22, sulfide type	90 Nov '61
—hum	44 Jul '65	—circuits in 1962 color		Pincushion circuits	8 Nov '65
Bench servicing	28 Nov '61	sets	89 Nov '61	Pincushion corrector (Zenith	
Bias-supply requirements	98 Nov '62	—loss of, RCA Chassis		25MC36 chassis)	39 Jun '65
Blue inoperative	46 May '64	CTC9	78 Dec '62	Power supply	8 Nov '63
Books available	40 Nov '63	—trouble, intermittent	80 Nov '61	Primary colors, chromas phase	
Burst amplifier, normal		Frequency response, band-		angles with respect to	
waveforms	48 Nov '61	pass amplifier	82 Nov '61	burst	4 Nov '61
Business, starting	40 Nov '63	Functions of color-signal		Purity-adjustment procedure	88 Nov '62
CRT Sizes	1 Nov '65	stages	22 Mar '61	Raster, blinking	72 Mar '64
Cables, extension for 25"		G-Y signal, recovery by		Raster dim, video normal	67 Nov '65
receivers	13 Jul '65	receiver	3 Nov '61	Registration poor (RCA)	52 May '64
Chassis layout	32 Nov '65	Gray scale adjustment		Replacement-parts stock	52 Aug '62
Chassis or CRT troubles, how		impossible	68 Nov '65	Response of eye to light waves	
to distinguish between	36 Feb '64	Gray scale tracking	33 Sep '65	of different frequencies	1 Nov '61
Chroma alignment	38 Nov '64	Green picture	46 May '64	Retrace lines	72 Nov '65
Chroma bandpass alignment	115 Nov '65	Guide to chassis layout	32 Nov '65	Ringings caused by misalign-	
Chroma bandpass amplifier		Gun killers	64 Mar '63	ment	29 Nov '65
—operating principles	26 Nov '61	Highlights green, lowlights		Sales	56 Aug '64
—single-stage circuit typical		red	71 Nov '65	Saturation and phase	46 May '64
of 1962 designs	34 Nov '61	High-voltage adjustments	97 Nov '62	Saturation, definition	1 Nov '61
Chroma circuits (Motorola)	32 Jul '63	High-voltage and focus,		Screen-control adjustment	34 Sep '65
Chroma demodulator		troubleshooting	41 Nov '65	Service aids	24 Nov '62
—circuits in 1962 color		High-voltage circuits	34 Apr '63	Service-charge recommenda-	
sets	34 Nov '61	High-voltage regulation poor		tions	50 Nov '62
—theory of operation	6 Nov '61	(RCA Chassis CTC5)	111 Nov '65	Service, how to increase	44 Nov '65
Chroma-phase color wheel	62 Feb '63	High-voltage regulators	62 May '65	Servicing for the beginner	58 Nov '63
—NTSC	33 Nov '63	Home-call servicing	36 Nov '61	Setup procedure	34 Sep '65
Chroma oscillator and control,		Horizontal sweep and sync,		Shop setup for color service	36 Nov '62
circuit theory	39 Sep '63	troubleshooting	117 Nov '65	Signal formation at trans-	
Chroma reference and control		Horizontal sweep circuits	34 Apr '63	mitter	2 Nov '61
circuits	48 Nov '64	Horizontal sweep intermittent,		Signal paths in chroma	
Chroma reference oscillator		RCA Chassis CTC7		section	28 Nov '61
operating principles	48 Nov '61	through—11	88 Oct '62	Signal tracing	36 Nov '64
Chroma section		Hues inaccurately reproduced	32 Nov '62	Signal tracing in circuits	
—troubles, step-by-step chart		Hum bars in color	86 Nov '61	associated with CRT	
for pinpointing	29 Nov '61	I and Q signals, definition	4 Nov '61	grids	32 Nov '62
Chroma signals	3 Nov '61	Incorrect colors, analyzing		Snow in color	80 Nov '61
Chroma-sync circuit, RCA		cause	28 Nov '61	State-of-art report	52 Nov '65
Chassis CTC7A	33 Nov '61	Instructing customers in using		Status of color TV industry	62 Nov '62
Chroma sync circuits	38 Sep '63	set	52 Nov '62	Sync, vertical or horizontal,	
Chroma sync, from stations	5 Nov '63	Instruments for tough-dogs	68 Mar '64	affected by color recep-	
Chroma sync phase detector,		Interference, internal	70 Nov '65	tion	81 Nov '61
circuit theory	39 Sep '63	Interleaving video, chroma		Temperature adjustments	33 Sep '65
Closed circuit	36 Nov '63	signals	4 Nov '61	Ten years of color—a report	99 Nov '64
Color-bar hints	52 May '64	Isolating chroma trouble (chart)		Test equipment	
Color-bar waveform analysis	33 Nov '62	—in home	38 Nov '61	—accessories and service	
Color-difference amplifiers	6 Nov '61	—in shop	29 Nov '61	aids	31 Nov '61
—general troubleshooting	94 Nov '62	Keyed rainbow generator		—color test jig for bench,	
—tube failure, RCA		—operating principles	66 Nov '61	RCA No. 11A1015	42 Nov '61
Chassis CTC9	56 May '62	—use in signal tracing	33 Nov '61	—instruments available	
Color-difference signals	2 Nov '61	Keyed rainbow signals	33 Nov '62	(chart)	30 Nov '61
Color displaced	41 Jul '65	Killer phase detector, circuit		Test equipment for	38 Mar '63
Color fringing in b-w pictures	34 Nov '62	description	39 Sep '63	Test equipment for 1965	30 Jan '64
Color incorrect	44 Jul '65	Kit form	97 Nov '65		84 Nov '64
Color missing, b-w normal	84 Nov '65	Loss of color		—CRT checkers	90 Nov '64
Color sync, loss of	41 Jul '65	—case history	32 Nov '61	—oscilloscopes	93 Nov '64
Color sync stages, trouble-		—troubleshooting		—signal generators	90 Nov '64
shooting with scope	32 Sep '62	procedure	36 Nov '61	Test-equipment needs	48 Aug '62
Complementary colors	8 Nov '61	Low-voltage stages,		Test generators for	32 Nov '63
Convergence	32 Sep '64	troubleshooting	40 Nov '65	Test signal, description	32 Nov '63
—adjustment procedure	32 Jan '61	Luminance channels	3 Nov '63	—displays	39 Nov '63
—intermittent	79 Nov '61		41 Nov '64	3.58-megacycle oscillator	
—test equipment for	68 Nov '61	Luminance signal	2 Nov '61	dead	44 Jul '65
Convergence dynamic, table		Matrixing of Y and color-		Transmitted color signal	1 Nov '61
showing sequence of		difference signals in		Transmitting color from TV	
adjustments	35 Nov '62	receiver	7 Nov '61	station	38 Nov '62
Convergence, static	89 Nov '62	Misalignment	44 Jul '65	Trouble case histories	80 Nov '61
Degaussing	24 Nov '62	Modulation on color		—brightness control ineffec-	
Degaussing tool	82 Jul '65	subcarrier	4 Nov '61	tive, RCA Chassis	
Demodulator and matrix,		Motorola 23" set	30 Jul '63	CTC7A	55 Jul '61
RCA Chassis CTC11	6 Nov '61	New features of '62 models	34 Nov '61	—ghosts in color	76 Nov '61
Demodulator operation	96 Nov '62	Outlook for future	45 Nov '65	—intermittent converge. nc	79 Nov '61
Demodulators	6, 58, 62 Nov '63	Parts stock guide	22 Feb '65	—loss of color	32 Nov '61
—alignment	62 Feb '63	Pattern generators, desirable		Tubes commonly used in	
	64 Mar '63	characteristics	68 Nov '61	chroma section	38 Nov '61
Divided-carrier modulation	5 Nov '61	Performance checks	29 Nov '65	Tuner AFC discriminator	113 Nov '65
Dot and crosshatch generators,		Phase and saturation	46 May '64	Tuner AFC, troubleshooting	37 Nov '65
desirable characteristics		Picture symptoms	38 Nov '63	VHF oscillator, automatic	
for use in convergence	68 Nov '61	Pictures symptoms for home		frequency control	36 Nov '65

Vertical arcing	58 Nov '64
Vertical hold critical	110 Nov '65
Vertical jitter, impure raster	78 Nov '65
Vertical problems	52 Nov '63
Vertical sweep, trouble-shooting	40 Nov '65
Video or sound missing, RCA Chassis CTC10	74 Aug '62
Video-sweep-modulated method of chroma band-pass alignment	34 Jun '62
Waveform checkpoints in	40 Mar '65
Waveforms, how to analyze	38 Nov '65
Weak or wrong colors, causes of	28 Nov '61
White compression	36 Feb '64
X demodulator dead	44 Jul '65
X and Z demodulation	6 Nov '61
Zenith 25MC36 chassis	38 Jun '65

CRT's

See *PICTURE TUBES*

COMMUNICATIONS

Aircraft radio	34 Sep '64
Alignment	
—generator	90 May '64
—techniques	1 Apr '64
Antenna installation in vehicle	92 June '62
Antennas	22 Jul '61
	48 Apr '63
	76 Apr '64
—installing	38 Apr '63
Antenna tester, Seco Model 520	77 Dec '61
Aviation frequency assignment	96 Sep '64
Bench power hook-ups for various two-way radios	92 Dec '61
Business radio	62 Jan '65
CB alignment	30 May '65
CB customers, finding and keeping	58 Feb '65
CB rules	62 Jan '65
CB sales methods	60 Feb '65
CB servicing	62 Feb '65
Clippers for audio	44 Oct '63
Clipper, transistorized	92 Apr '64
Control circuits and inter-cabling in two-way radios	7 Jun '62
Crystals	38 Jun '62
Delay line	70 Jul '64
FCC field-office directory	22 Sep '61
FCC rule changes	62 Jan '65
FM RF circuits using transistors	84 Sep '65
FM modulator operation	68 Jul '64
FM transceiver	84 Sep '65
Field-strength meter in test set	39 Sep '61
Final amplifiers	84 Sep '65
Frequency	
—adjustment	7 Apr '64
—meter, CB	70 Apr '64
—syntheses	86 Apr '64
Front end alignment	7 Apr '64
HELP transceiver	21 Jul '65
High-frequency transmitters	32 Feb '63
Industrial	
—CB applications	98 Apr '64
—radiotelephones	90 May '64
License, second-class, studying for	22 Sep '61
Limiters, modulation	92 Apr '64
Low IF alignment	7 Apr '64
Manufacturers, list	54 Jan '63
Mobile-base-portable, combination	60 Jul '64
Mobile radio, installation in vehicle	28 Jun '62

Modulation	
—checks	4 Apr '64
—limiter action	92 Apr '64
—types of	68 Jul '64
Modulator, semi-conductor junction	70 Jul '64
Multiband receivers, alignment	34 Dec '63
Multiplier alignment	5 Apr '64
Noise clippers	44 Oct '63
—Seco Model 530	78 Jan '63
Oscillator peaking	4 Apr '64
Over-modulation, preventing	68 Jul '64
PA alignment	5 Apr '64
Phase modulator	69 Jul '64
—transistorized	70 July '64
Power supplies, mobile type	1 Jun '62
Prices charged for service work	26 Jun '62
RF stage alignment	78 Apr '64
Radio paging	72 Jul '64
Radiotelephones	69 Apr '64
—marine	62 Jul '64
Receiver alignment	7 Apr '64
Selective calling	74 Jul '64
Selective-calling systems	34 Feb '62
Service business, using in	50 Jan '63
Signal generator applications in testing	31 Apr '61
Speech amplifier, transistorized	70 Jul '64
Squelch circuit, analysis and trouble shooting	32 Jun '62
Squelch systems, tone-coded	58 Sep '62
Test equipment for	38 Mar '63
	1 Apr '64
Test-equipment items needed	30 Apr '61
Test set for metering-two-way transmitters and receivers	82 Jun '62
Tower maintenance	86 Oct '64
Transistorized microphones	66 Jul '64
Transistors in RF circuits	76 Sep '65
Transistor alignment	67 Apr '63
	4 Apr '64
Transmitter and antenna tester	54 Feb '64
Tube stock guide for mobile and CB radio servicing	60 Feb '62
Two-way radio troubleshooting chart	8 Jun '62
Two-way receiver maintenance	5 Jun '62
Two-way transmitters, alignment and troubleshooting	3 Jun '62
VHF	
—aircraft radio	35 Sep '64
—FM radios	70 Apr '64

DIODES

AFC, FM	34 Feb '64
Germanium crystal	26 Jan '61
	26 Jul '61
Measuring	82 Oct '63
Molecular electronics, in	50 May '63
Regulators, shunt	3 Jun '65
Selenium AFC	87 Jan '61
—replacements	27 Jul '61
Tester	66 Mar '63
Transistor portables, in	78 Feb '63
Tunnel, characteristics	70 Mar '63
Zener, testing	72 Mar '63

FIELD-STRENGTH METERS

Antenna, for use with	72 June '63
Blonder-Tongue Model FSP3	70 Jun '63
Hickok Model 235A	90 Nov '65
Jerrold Model 704B	46 Mar '65
Philmore Model FS1W	78 Jun '62
Sadelco Model FS2	84 Jul '65
Solid-state	4 Jun '65

FLYBACK TRANSFORMERS

See *HORIZONTAL OUTPUT TRANSFORMERS*

FM RADIO

See also *STEREO FM AFC*

—defeat switch	72 Feb '64
—semiconductor diode	34 Feb '64
—servicing chart	74 Feb '64
Alignment	62 Sep '63
Alignment hints	54 Feb '62
Auto sets	26 Jul '63
Background-music systems, in	28 Feb '62
General circuit features and service hints	48 Feb '62
IF alignment	33 Feb '65
Oscillators, transistor	8 Jun '63
Tracking adjustments	32 Feb '65
Tuning-eye installation	56 Jun '61
Tuning eyes	32 May '64

FOCUS TROUBLES

Causes of	76 Jan '63
Color sets, in	35 Apr '63
Flyback circuit, in	48 May '63
Older sets, in	77 Jan '63
Theory and troubleshooting	26 Jan '63

FUSES

Circuit-breakers	75 Aug '64
Stock guide	
—b-w TV	34 Jul '63
—color TV	88 Nov '63

GARAGE-DOOR OPENERS

Transistorized types	32 Jun '63
—manufacturers and troubleshooting	76 Jun '63

GENERATORS

See *SIGNAL GENERATORS*

GUIDES

Accessory probes	60 Mar '65
CB-communications tube usage	18 May '65
CRT substitution chart	68 May '61
Caddy for color servicing	88 Nov '63
Color chassis layouts	32 Nov '65
Color TV parts	22 Feb '65
Diode and rectifier replacement	27 Jul '61
Fuse stock, TV	76 Apr '63
	34 Jul '63
Fusible resistor cross-reference chart	75 Dec '62
High-voltage regulator troubles	62 May '65
Importers	38 Jun '64
Phono-tape repair charges	54 Aug '63
Radio batteries	52 Jun '63
Stock, TV tubes	78 May '64
	20 Apr '65
Test equipment	
—accessories	20 Jan '64
—specialized	38 Oct '64
Test equipment for shops	38 Mar '63
Transistor radio importers and manufacturers	22 Jun '65
Transistor radio parts	24 Jan '62
Tubes	
—newly introduced types for '61	84 Sep '61
—stock guide	34 May '61
	28 Oct '61
UHF antennas	32 Jul '65
Wire and cable	20 Feb '64

HI-FI SYSTEMS

See *AUDIO SYSTEMS*

HIGH VOLTAGE

Adjustments in color

receivers	82 Apr '63
Color circuits, 1965	7 Nov '64
Color sets, in	34 Apr '63
Missing	36 Feb '62
Missing or reduced	2 Jan '65
Rectifier, 5642, purple glow	74 Oct '61
Rectifiers repeatedly burns out	62 May '62
Regulator adjustments	65 May '65
Regulators	34 Apr '63
Transistor circuits	2 Jun '64
Weak and blooming	30 May '63

HORIZONTAL OSCILLATOR

AFC and oscillator, isolation servicing procedure	62 Feb '64
Adjustments	31 Jan '62
	41 Dec '62
Alignment	5 Dec '63
Anti-hunt network	36 Aug '63
Balanced diode AFC	29 Jun '63
Bends or twists	34 Oct '63
Cathode-couple multivibrator	5 Jan '65
Common cathode AFC	36 Aug '63
	6 Jan '65
Drive line, remedies for	4 Jan '65
Multivibrator operates at wrong frequency	26 Aug '62
Off-frequency	8 Dec '63
	5 Jan '65
—extreme	83 Feb '63
Phasing bar in center	29 Jun '63
Sine wave	8 Jan '65
Synchroguide	32 Feb '64
	7 Jan '65
Synchroguide adjustment	62 Oct '63
Theory of operation	28 Jun '63
	5 Jan '65
Transistor circuits	3 Jun '64

HORIZONTAL OUTPUT TRANSFORMERS

Color sets, in	35 Apr '63
Components in, checking	12 Feb '64
Connected incorrectly	68 Oct '63
Overheating	3 Jan '65
Replacement	42 Jul '62
Resistance checks of	3 Jan '65
Ringing checks, for	30 Mar '63
Testing	37 Feb '62
Troubleshooting	39 May '61

HORIZONTAL SWEEP

Barkhausen on Channel 5, from audio circuit	82 Sep '63
Boost defect	3 Jan '65
Circuit description	42 Sep '63
Collapsed; high-voltage normal	30 Sep '61
Color sets, in	34 Apr '63
Dim raster	4 Jan '65
Drive insufficient	2 Jan '65
Drive line, causes for	4 Jan '65
Flyback and yoke circuit operation	4 Jan '65
High-voltage regulation, poor	111 Nov '65
Interference, radiation	60 Apr '62
Intermittent	44 Sep '63
Linearity adjustments	4 Jan '65
Linearity coil adjustment	40 Feb '62
Linearity faults	4 Jan '65
Linearity magnet, replacement	34 Sep '63
Loss of	36 Feb '62
Monitoring intermittent	72 Aug '63
Nonlinearity	82 Feb '65
No raster, causes for	2 Jan '65
Repair, final checkout of	49 Jul '62
Ringing and stripes	87 Apr '63
Screen resistor, changed value	60 Feb '64

Transistor circuits	2 Jun '64
	29 Oct '65
Troubles that cause misshapen rasters	32 Apr '62
Troubleshooting	1 Jan '65
Vertical stripes, caused by	87 Apr '63
Width adjustments	4 Jan '65
Width and arcing caused by incorrect line voltage	66 Feb '65
Width decreased when oscillator is off frequency	27 Aug '62
Width and horizontal linearity	36 Oct '64
Yoke or flyback, shorted	3 Jan '65

HORIZONTAL SYNC

Bars in top of picture	32 Aug '65
Bends	33 Feb '62
	31 Feb '63
Christmas-tree effect	30 Jan '62
Drive waveform distorted	5 Jan '65
Flag-waving	33 Feb '62
Instability	4 Dec '63
Jitter	40 Dec '62
Locked out of phase	75 Feb '62
Loss of	6 Jan '65
Noise cancellor effects	79 Sep '65
Oscillator operates at incorrect frequency	80 Aug '62
	5 Jan '65
Phasing error	29 Jun '63
Piccrst effect	40 Oct '61
Programmed troubleshooting, chart	6 Dec '63
Pulling and weaving	69 Feb '62
	90 Oct '62
Pulses clipped	40 Sep '65
Scope for troubleshooting	39 Sep '65
Sine wave oscillator, circuit explanation	8 Jan '65
Synchroguide	
—common troubles in	54 Oct '62
	32 Apr '64
Tearing, intermittent	68 Jun '61
Tearing, severe	79 Sep '65
Theory explanation	36 Aug '63
Troubleshooting	37 Aug '63
	5 Jan '65
Unstable	30 May '63
—caused by boost trouble	36 May '64
—vertical jitter	40 Sep '65
Weaving and twisting	40 Sep '65

HUM

Audio system, in	62 May '64
Bars or wiggle in raster	40 Sep '61
Color bar pattern distorted, caused by	41 Jul '65
Electrolytic leakage, causing	50 Feb '65
Electronic musical instruments, in	72 Aug '64
Horizontal bars on screen	36 Apr '63
Video, in	18 Mar '63
Video signal, in	67 Jun '61

IF SECTION OF TV

Aligning and troubleshooting with sweep generator	30 Sep '62
Alignment	64 Mar '64
	48 Nov '65
Causing horizontal twist	34 Oct '63
Grid short, effect on picture	19 Mar '63
Oscillation	28 Jul '63
—effect on picture	18 Mar '63
Regeneration	28 Jul '63
Transistor circuits	6 Jun '64
Waveforms for aligning	28 Jan '65

INDUSTRIAL ELECTRONICS

Binary numbers	28 Jul '62
----------------	------------

CCTV	30 Oct '62
	74 Nov '63
Closed-loop control systems	50 Dec '62
Computers, digital	72 Nov '63
Control systems, automatic	31 Dec '63
Control transformers	82 Jan '61
Darkroom equipment	32 Jan '64
Differential transformers	52 Dec '62
Electrostatic air cleaners	46 Aug '64
Error detectors and correctors	50 Dec '62
Frequency meters	54 Apr '61
Gas amplification in phototube	28 Jul '61
Infrared	26 Oct '63
Light-dimming control using saturable reactor	52 Oct '61
Magnetic amplifiers	81 Oct '62
Magnetostrictive transducer	79 Apr '62
Microwave equipment, typical	41 Mar '65
Microwave servicing	42 Mar '65
Molecular	50 May '63
Oscilloscope accessories	52 Apr '61
Photoelectric relays	29 Jul '61
Photoelectric switches for illumination control	50 Oct '61
Piezoelectric transducer	76 Apr '62
Radar	38 Feb '65
	38 Apr '65
	72 Jul '65
Servomechanisms	83 Jan '61
Semiconductor applications	56 Jun '64
Small plants, equipment used in	30 Dec '63
Solid-state rectifiers	36 Sep '64
Solid-state relays	54 Jun '65
Synchros	
—electrical troubles	27 Mar '61
—mechanical-trouble chart	68 Mar '61
—motor and generator operation	36 Jan '61
Test equipment for	36 Mar '63
Thyratron circuits	32 Jan '64
Transistor circuits	68 Nov '63
Tunnel diodes	54 Mar '62
Ultrasonic cleaners	74 Apr '62
	65 Dec '63
Vibration test equipment	56 Apr '61
Voltmeter requirements for industrial servicing	52 Apr '61

INTERCOMS

Checkout of	70 Sep '65
Circuit analysis	65 Sep '65
Industrial	34 Aug '63
Installation	34 Oct '61
	34 Aug '63
Remote amplifiers as	66 Jan '64
System design	35 Aug '63
Transistor types	66 Sep '65
Troubleshooting	66 Sep '65
Wireless	76 Jan '64

INTERFERENCE

CB in television	68 May '65
Horizontal bars on screen	36 Apr '63
Ignition	71 Sep '61
Internal in color set	70 Nov '65
Locating source	62 Apr '62
Oscillation, Barkhausen	34 Jul '65
Parasitic oscillations	82 Sep '63
RF, finding and curing	34 Jul '65
RF from CB	14 Mar '62
Sources for tracing	35 Jul '65
TV, cause, effect, cure	12 Mar '64
Tracing with field strength meter	72 Jun '63
Types of	34 Jul '65
Visible in picture	28 Jan '62

INTERMITTENT TROUBLES

Capacitors	50 Jan '64
General information	26 Oct '61
Monitoring to troubleshoot	30 Aug '63
Sweep	42 Sep '63
Televisions receivers, in	50 Jan '64
Thermal	56 Aug '61
	46 Sep '63
Vertical creep	38 Oct '63

METERSSee *VOM's and VTVM's***MISCELLANEOUS**

ASCAP and BMI, role in background music	51 Aug '65
Air conditioners	24 Jun '61
Appliance servicing	22 Feb '63
Electronic depth finders	26 Jun '61
Electronic music instrument servicing	34 Aug '65
Electronic Organ	69 Feb '61
Electronics at the World's Fair	1 Jul '65
Import trends	46 Sep '65
MPATI	40 Jan '63
Photoflash, electronic	44 Feb '61
Small electrical appliances	30 Aug '61

MULTIPLEXSee *STEREO FM***NOTES ON TEST EQUIPMENT**See *Specific Type Instrument or TEST EQUIPMENT***OSCILLOSCOPES**

Advantages in using	31 Jan '64
Calibrator, Acme Model PS39590	51 Sep '65
Circuit descriptions	7 Mar '63
Crosstalk in	7 Mar '65
DC response	8 Mar '65
DC wideband, EICO Model 435	39 Aug '65
EICO Model 430	46 Jul '64
EICO Model 427, DC-AC type	64 Jun '63
—ringing test, using	68 Jun '63
Electronic switch for, EICO Model 488	58 Jan '63
Hash and distortion on traces	34 Dec '62
Heath Model IO-10, DC type	68 May '63
Heath Model IO-12	70 Jan '65
Hickok Model 677	56 Dec '63
Jackson Model 600	56 Sep '61
Precision Apparatus Model ES-525	70 Jan '61
RCA Model WO-91A	70 Sep '62
RCA Model WO-91B	58 Oct '65
Repair and improve	48 Jul '63
Requirements for color service	70 Nov '61
Ring checks for coils	30 Mar '63
SENCORE Model PS120	78 Nov '62
SENCORE Model PS127	71 May '65
Sensitivity, testing	4 Mar '65
Triggered sweep, how they work	99 Mar '65
Triggered sweep vs. conventional	100 Mar '65
Troubleshooting, of	48 Jul '63
Using	34 Mar '63
Vertical attenuator, adjusting	6 Mar '65
Vertical bounce, eliminating	5 Mar '65
Voltage-calibration techniques	36 Dec '62
Voltage measurements with	34 Jan '64
Waterman miniature	58 Nov '61

PA SYSTEMSSee *AUDIO SYSTEM***PHONOGRAPHS**See *RECORD CHANGERS***PICTURE TUBES**

Bonded types	36 Feb '65
Brighteners, effects of	76 Nov '63
Brightness poor	31 May '63
Color	
—replacement of	42 Nov '64
—troubles in	36 Feb '64
Color CRT sizes	1 Nov '65
Comparison of round and rectangular	36 Feb '65
Construction of	36 Feb '65
Mounting techniques	36 Feb '65
Rejuvenation	76 Nov '63
Spark gap to protect	59 May '61
Substitution chart	68 May '61
Test types for substitution	46 May '63
Testing	82 Oct '63
Types designed to replace numerous other types	24 Jul '62

POWER SUPPLIES

Adjust-A-Volt Model IV1-4M, AC type	64 Feb '63
B+ paths, tracing	34 May '65
Cornell-Dublier <i>Portapower</i> Model 12PP14 power converter	64 Aug '64
DC supply by molecular electronics	56 May '63
Delco radio Model T-612	62 Apr '64
EICO Model 1037	44 Aug '61
EICO Model 1064	74 Dec '61
Electro Labs Model EC-3, transistor	56 Jul '63
Electro Model EC-2	80 Nov '62
Electro Products Model PS-3	38 Mar '61
Filters in	38 Feb '64
Filter troubles	37 Apr '63
Heath IP-22 isolation transformer	54 Sep '64
Jackson Model 607	48 Jun '61
Oscilloscopes, for	42 Jul '63
Paco Model B12	58 Oct '61
Precision Model P25, transistor radio battery eliminator	54 Apr '63
Seco Model RPS4, regulated supply	48 May '63
Seco Model RPS5, regulated power supply	85 Sep '64
SENCORE Model BE124, battery eliminator	50 Sep '63
Solid-state inverter	73 Aug '64
Stabilized variable AC type	54 Sep '64
Stacked B+, trouble in	84 Feb '63
Terado Model 50-204	58 Jan '64
Transistor regulators	3 Jun '65
Transistor servicing, for	56 Jul '63
Transistor TV, used in	1 June '64
Transistor circuits in two-way equipment	88 Oct '64
Variable transformers for checkout	64 Feb '65
Voltage divider networks	52 Feb '65

PREVIEWS OF NEW SETS

Admiral Model ST19J169, Chassis 15H1	1 May '61
Admiral Model LG5315, Chassis G-1263-1	1 Jul '65
Admiral Model STF351, Chassis 19C8B	3 Sep '62
Admiral Model STF33X11, Chassis 21X3U	1 Sep '63
Admiral Model UP1112C, Chassis C21A10-2C	1 Mar '64
Admiral Model STF-24M169, Chassis 20C7	1 Jan '61
Admiral Model STG-24J131,	

Chassis 20L7	1 Sep '61
Admiral Model 2711, Chassis 20L8	3 Apr '62
Admiral Model 93F16, Chassis 16F3B	3 Apr '63
Airline Model GSP-4615A	1 Apr '65
Airline Model WG-2713A, Chassis 23S31	1 May '63
Airline Model WG-5277A, Chassis 23S15SG	1 Jul '62
Airline Model WG-6030A	2 Jan '61
Andrea Model WFCO-VS323-5, Chassis VS323-5	1 Aug '61
Andrea Model VPP319	1 May '64
Arvin Model 63K19	2 May '64
Bradford Model 96735A, Chassis 23S33	1 Feb '63
Clairtone Model ST-801, Chassis S-2	2 Sep '63
Columbia Model C-23P6216, Chassis 1056-12	1 Jul '63
Coronado Model TV17-9444A, Chassis 1194-72	3 Sep '63
Curtis-Mathes Chassis TV19-2	1 Sep '65
Delmonico Model UHF-19	1 Feb '65
Delmonico Model CC-210	1 Nov '62
Delmonico Model PPV-M3U	4 Sep '62
DuMont Model 800B-108, Chassis 120612-A	1 Dec '62
DuMont Model RA-700A-B50, Chassis 120602A	1 Jul '61
Electrohome Model Gate-wood	3 Jan '63
Emerson Model 1534, Chassis 120541C	1 Mar '61
Emerson Model 1542, Chassis 120564C	2 Aug '61
Emerson Model C-2001A, Chassis 120585	2 May '63
Emerson Model D2011, Chassis 120744G	2 Feb '65
Emerson Model R-1818, Chassis 120593-A	2 Jul '62
Emerson Model U1840, Chassis 120673-C	2 Mar '64
Emerson Model 1554, Chassis 120572-C	4 Apr '62
Fleetwood Chassis 1010	1 Feb '61
General Electric Model M10YDG, Chassis SY	1 Feb '64
General Electric Model M204WVY, Chassis LW	2 Sep '61
General Electric Model M403AVY, Chassis DA	2 Apr '65
General Electric Model M503XED, Chassis QX	4 Jan '63
General Electric Model TAM203YVY, Chassis LY	2 Jul '63
General Electric Model R870VWD, Chassis U5	2 Mar '61
Grundig Model PV59T50	3 Feb '65
Hoffman Model B3823, Chassis 356	3 Mar '61
Magnavox Model 1MR-303N, Chassis C44-03-00	1 Aug '64
Magnavox Model 1U107, Chassis U49-01-00	1 May '65
Magnavox Model 1U401M, Chassis 35-02-00	2 Jul '61
Magnavox Model 2MV135D, Chassis V38-04-00	2 Dec '62
Magnavox Model 2MV360M, Chassis 36-03	5 Apr '62
Motorola Model 19P15, Chassis PS-449A	3 Feb '62
Motorola Model 19RT29CH, Chassis RCDTS-584B	2 Feb '63
Motorola Model 23K40CW, Chassis VTS-569	3 Aug '61
Motorola Model A19T2-3, Chassis WTS-435	2 May '61

Motorola Model A19T8CHA, Chassis WTS-436D	3 Dec '61
Motorola Model Y23CK38M-2, Chassis TS908Y	1 Sep '64
Motorola Model Y28K89, Chassis TS-586	2 Feb '64
Muntz Model 23CP3, Chassis P37AB11	3 Feb '63
Olympic Model 9T22, Chassis 10119	3 May '63
Olympic Model 9TX11, Chassis LX	3 May '62
Olympic Model 17PU95, Chassis KU	2 Feb '61
Olympic Model K-985, Chassis NAP	2 May '65
Packard Bell Model 19T22, Chassis 8814P	3 Mar '64
Packard Bell Model 21CC4, Chassis 98C6	2 Nov '62
Packard Bell Model 23DC10M, Chassis 98D14	4 Feb '62
Packard Bell Model 23DD3, Chassis 98D10	1 Jun '61
Packard Bell Model 23K6, Chassis 88-16C	3 May '65
Panasonic Model AN-144	4 Apr '63
Panasonic Model AN-16	2 Sep '65
Panasonic Model Mitey 9	3 Feb '64
Philco Model J-3210PL, Chassis 11J27	4 Mar '61
Philco Model J-4818, Chassis 11N53	3 Jul '61
Philco Model K-3244SA, Chassis 12J28A	3 Jul '62
Philco Model K-4850WA, Chassis 12N53	5 Feb '62
Philco Model L2602BR, Chassis 13G20	4 Sep '63
Philco Model L-3814RWH, Chassis 13J42	5 Jan '63
Philco Model M4504MR, Chassis 14N50A	2 Aug '64
Philco Model N1200BR	2 Jul '65
RCA Model 64A030MU, Chassis KCS146	4 Feb '64
RCA Model 192-A-079RS, Chassis KCS137P	4 Dec '61
RCA Model 193-A-542-MV, Chassis KCS140A	5 Sep '62
RCA Model 211CB412, Chassis CTC11	4 Aug '61
RCA Model 211CDR936U, Chassis CTC10	3 Feb '61
RCA Model 213-G-276-MV, Chassis CTC12	3 Nov '62
RCA Model 232B152MV, Chassis KCS136A	2 Jun '61
RCA Model 233-B-605-RS, Chassis KCS136YA	5 Apr '63
RCA Model AF-020J, Chassis KCS152A	3 Apr '65
RCA Model AG-159E, Chassis KCS149AA	3 Sep '65
Sears Model 5170, Chassis 562.10102	3 Jul '65
Setchell-Carlson Model 3C64, Chassis U800	2 Sep '64
Setchell-Carlson Model 19C61, Chassis 361	3 Jun '61
Setchell-Carlson Model 19P68R, Chassis C219	4 May '62
Setchell-Carlson Model 601C, Chassis X159	3 Jan '61
Silvertone Model 1134, Chassis 528.50356	4 Jan '61
Silvertone Model 3115, Chassis 528.60173	3 Jul '63
Silvertone Model 4101, Chassis 528.60269	3 Aug '64
Silvertone Model 21061, Chassis 528.52422	5 Dec '61

Silvertone Model 21461, Chassis 528.51894	6 Apr '62
Silvertone Model 21941, Chassis 528.51868	3 Dec '62
Sonora Model S64K236W	3 Sep '64
Sony Model 8-301W	5 May '62
Sony Model TV-5-305UW	4 Sep '65
Sylvania Model 19P11, Chassis 546-1	4 Jun '61
Sylvania Model 19P35, Chassis 561	3 May '64
Sylvania Model 19T09 series, Chassis 563-4	6 Apr '63
Sylvania Model 23L48F, Chassis 555-01	6 Dec '61
Sylvania Model 23L133CU, Chassis 585-1	4 Apr '65
Symphonic Model 23BSC101	6 Jan '63
Trav-Ler Model 19T6233, Chassis 1180-12	6 Sep '62
Truetone Model 2DC1300B, -C, Chassis 23S35	4 Jul '63
Truetone Model 2DC3416	4 Aug '64
Truetone Model 2DC3250, Chassis 1171-62	4 Dec '62
Westinghouse Model H-K4120U, Chassis V-2417	6 May '62
Westinghouse Model H-K4150, Chassis V-2411-6	3 May '61
Westinghouse Model H-P3001U, Chassis V-2438-2	4 Feb '63
Westinghouse Model H-P3150U, Chassis V-2384-15	3 Sep '61
Westinghouse Model H-3433, Chassis V-2443-3	4 May '64
Westinghouse Model H-P8020, Chassis V-2478-2	4 May '65
Zenith Chassis 25MC33	4 Jul '65
Zenith Model F3344E, Chassis 16E24Q	4 May '61
Zenith Model F3368M, Chassis 16F28Q	4 Feb '61
Zenith Model F3388W, Chassis 16F23Q	4 Jul '61
Zenith Model G3360W, Chassis 17G28Q	4 Sep '61
Zenith Model J3350L, Chassis 16J22QS	4 Jul '62
Zenith Model K3341H, Chassis 16K23QS	4 May '63
Zenith Model M2231LU, Chassis 14M27	4 Feb '65
Zenith Model ML2784W3, Chassis 16L24	4 Sep '64
Zenith Model P2203J, Chassis 14L30	4 Mar '64
Zenith Model 5040W, Chassis 29JC20	6 Feb '62
Zenith Model 6015W, Chassis 27KC20Q	4 Nov '62

PROBES

Demodulator	2 June '65
Guide, cross reference	60 Mar '65
Low-cap probe	
—calibrating	78 May '63
—using	35 Mar '63
RF, with VTVM	43 Mar '63

RADIO

Also see <i>AUTO AND TRANSISTOR</i>	
AM IF alignment	32 Feb '65
Buzz and hum, cures for	26 Jan '65
Crystal-controlled tuners	77 Jan '64
FM, AFC	34 Feb '64
Filament problem, in	34 Jan '63
IF transformers, repairing	26 Dec '61
Local-oscillator test	42 Aug '62
Repair technique, rapid	38 Aug '62
Servicing small AC-DC types	18 Feb '61
Troubleshooting chart	45 Aug '62
WWV standard test tones	36 Dec '62

RASTER (FAULTS)

Abnormally shaped	32 Apr '62
Absent	2 Jan '65
Blooming and HV loss	36 May '64
Brighteners, effects of	76 Nov '63
Brightness control inoperative	28 Aug '63
Christmas-tree effect	30 Jan '62
Cup-shaped	33 Apr '62
Defects, as trouble clue	38 Dec '62
Dim, blanker troubles	68 Mar '64
Keystoning, not caused by yoke	32 Apr '62
Picture missing, blank or snowy raster	62 Jan '61
Pie-crust effect	39 Dec '62
Pulsating, caused by audio circuit	81 Sep '63
Width and height reduced	32 Oct '64

RECORD CHANGERS

Adjustments	1 Aug '63
Buzz and hum, cures for	27 Jan '65
Charges	54 Aug '63
Drive belt slippage, eliminating	58 May '65
Idler drive maintenance	29 Aug '65
Ripple waveforms, normal and abnormal	26 Jan '65
Test recordings	72 Aug '63
Tools and materials for cleaning	29 Aug '65
Troubleshooting	1 Aug '63

RECTIFIERS

Color TV focus type	75 Oct '64
Silicon-controlled type	62 Jun '64
Silicons for selenium, substituting	34 Sep '63
Solid-state circuits	1 Jun '65
Solid-state type	36 Sep '64

REMOTE CONTROL, TV

Transistorized units	32 Oct '62
Troubleshooting	20 Jun '61
Wireless, for antenna rotators	33 Oct '62

RESISTORS

Analyzer	58 Oct '64
Change in value	50 Jan '64
Components acting as, other	84 May '63
Decade	93 Mar '64
Heavy-duty potted type	77 Jan '64
Integrated networks, square- wave testing	30 Oct '65
Light-dependent	83 May '63
	62 June '64
Light-sensitive	36 Apr '62
Pads and attenuators	32 Oct '65
Peak limiting, for	60 Sep '64
RC circuits, square-wave testing	33 Aug '65
Resistance measurements	22 Oct '62
Square-wave tests for	37 May '65
Substituter	58 Feb '64
Thyrte	75 Sep '63
Types of	20 May '63
Voltage dividers as	52 Feb '65
	34 May '65

SCOPES

See *OSCILLOSCOPES*

SEMICONDUCTORS

See also *DIODES AND TRANSISTORS*

AFC diodes	34 Feb '64
Analyzer for	95 Mar '64
Diodes	56 Jun '64
—AFC, in FM	34 Feb '64
4-layer diodes	48 Jun '65
Hybrid circuits	64 Jun '64
Industrial applications	56 Jun '64

Light-dependent resistor	62 Jun '64
PIN diode	63 Jun '65
Packaging of	64 Jun '64
Quad, diode	58 Jun '64
Silicon-controlled rectifiers	62 Jun '64
	73 Jun '65
Silicon rectifier, replacement for tubes	75 Jan '64
TV circuits, as used in	1 Jun '64
Tester, combination with tube	96 Mar '64
Thermistor	62 Jun '64
—protective devices, as	62 Sep '64
Thyrectors	94 Sep '64
Tunnel diode	60 Jun '64
	46 Jun '65
Varactor diode	58 June '64
	48 Jun '65
Varistor	62 Jun '64
Zener diode	58 Jun '64
	46 Jun '65

SIGNAL GENERATORS, AUDIO

Circuits, general	9 Mar '63
GC Model 36-568, part of	58 Aug '63
Jackson Model 605, -6	38 Mar '61
RCA Model WA-44C	63 Feb '61
Simpson Model 407, remote aligner	99 Nov '63
Solid-state	6 Jun '65

SIGNAL GENERATORS, RF

Alignment, for	33 Feb '65
Aligning TV with	60 Mar '64
Attenuator, with	44 Mar '64
Broadcast stations as fre- quency calibration standard	77 Dec '62
Circuits, general	9 Mar '63
Color TV, manufacturers of	100 Nov '63
Color testing, for	32 Nov '63
Communications equipment, for	3 Apr '64
EICO Model 369, sweep generator	50 Apr '65
Electronic Measurement Corp. Model 501	58 Apr '64
Gain tests, using for	46 Mar '63
Paco Model G-32W	66 Aug '62
Precision Apparatus Model E-75	64 Mar '62
RCA Model WR-50A	68 Jun '64
Solid-state	7 Jun '63
Stereo FM manufacturers of	33 Mar '63
Sweep and marker generators, requirements for color alignment	72 Nov '61
Sweep frequency	95 Mar '64
Troubles in	54 Mar '64
Using more effectively	30 Sep '62

SOUND SECTION OF TV

Alignment of IF in	66 Mar '64
Buzz	
—in intercarrier circuits	20 Jul '62
—unaffected by fine tuning	77 Dec '62
—variable with fine tuning	77 Mar '62
Buzz in sound	
—recognizing intercarrier and vertical-sweep types	30 Jun '61
—scope check of Sound-IF signal for pulse modula- tion	1 Apr '61
—service hints	30 Jun '61
Circuit features, unusual	80 Sep '63
Circuit variations	36 Sep '63
Detector 'DT6	34 Jun '61
Intercarrier circuits	20 Jul '62
Intermittent	
—monitoring for	71 Aug '63
Reflex sound AF circuit	76 Dec '62

Ripple, how decrease	27 Jan '65
Transistor circuits used in	8 Jun '64
Troubleshooting, with headset	36 Sep '63
Waveforms for trouble- shooting	27 Jan '65

SPEAKERS

Enclosures	48 Feb '63
Impedance matching	58 Oct '63
Impedances and power	56 Feb '63
Installations	
—audio systems, in	56 May '64
—rear deck auto	68 Aug '64
Manufacturers	48 Feb '63
Matched extensions systems	76 Oct '64
Pads and attenuators, use of	33 Oct '65
Phasing	62 Feb '62
	60 May '64
Repair, how to	52 May '65
Requirements for various applications	27 May '61
Systems	82 May '62
Transistor portables, in	79 Feb '63
Transistor radios, for	75 Jan '62

SQUARE-WAVE GENERATORS

Analysis of	79 Apr '65
Capacitor checking, for	36 Jul '65
Equipment setup for checking resistance	38 May '65
Inductors, for testing	50 Jun '65
Multiple terminal networks, for checking	93 Oct '65
Paco Model G-34	64 Jan '63
RC circuits, for testing	33 Aug '65
Resistors, for checking	38 May '65
Termination	39 May '65

STEREO FM

Adapters, adding to receivers	86 Dec '62
Alignment	78 Nov '63
—equipment for	32 Mar '63
	58 Sep '63
—principles	30 Jul '64
Antenna requirements	34 Aug '62
Circuit analysis	38 Oct '65
Customer problems	88 Dec '62
Equipment requirements for alignment	31 Jul '64
FCC requirements	38 Oct '65
Hybrid receivers	47 Aug '65
Indicator lamps	40 Oct '65
Pilot-channel adjustment	31 Jul '64
Receivers, circuit operation	27 Aug '65
Solid-state	28 Aug '65
Squelch circuits	39 Oct '65
Stations on air	26 Dec '62
Transistors in	39 Oct '65

STEREO FM GENERATORS

Calbest Model MX625SG	52 Jul '62
Heath Model IG-112	38 Jul '65
Hickok Model 725	64 Apr '63
Hickok Model 727	74 Feb '65
Karg Labs Model MX-1G	76 Oct '63
RCA Model WR-51A	78 Nov '63
SENCORE Model MX129	66 Aug '64
Zenith Model SPTE-1	66 Jun '64

SYMFACT

Audio output, push-pull with driver	59 Aug '65
Automatic brightness-con- trast control	25 Feb '64
BN6 Sound detector	21 Jan '65
BU8 AGC section	25 Oct '62
BU8 Sync section	34 Sep '62
Chroma Sync, burst amp.	27 Mar '65
Convertor Stage, transistor	36 Jun '64
CRT Circuits, AC Coupled,	

grid-driven	25 Aug '63
CRT Circuits, DC-Coupled, cathode-driven	21 Jul '63
Difference Amplifier, R-Y, B-Y, G-Y	63 Nov '65
Full-wave silicon doubler	29 Apr '63
Horizontal AFC, Common- cathode type	25 Nov '63
Horizontal AFC, Series diode type	21 Dec '63
Horizontal AFC, Synchro- guide	25 Jul '64
Horizontal output, grid as bias source	27 Oct '64
Horizontal output stage	55 Sep '65
Keyed AGC, cathode grounded, IF grid positive	24 Jun '63
Power supply, transistor sets	67 Oct '65
Reflex sound IF, Video and sound in one tube	25 May '64
Sound detector, 6DT6	29 Jan '63
Stacked B+, Audio output as voltage divider	65 Jul '65
Stagger-tuned IF, second and third stages	27 Apr '65
Switch tuner, nuvistor RF amplifier	27 Dec '64
Sync separator, single triode	23 Mar '64
Sync separator AGC, com- pactron	37 Dec '65
Transistor AGC circuit, keyed-amplified	27 Jun '64
Transistor Horizontal Oscilla- tor, blocking-type wth diode AFC	23 Sep '64
Transistor output stage, radio	24 Jun '63
Transistor sound IF, with ratio detector	27 Jun '65
Turrent tuner, frame grid RF	25 Aug '64
Vertical multivibrator, control circuits	29 Nov '62
Vertical multivibrator, output and feedback circuits	31 Dec '62
Vertical oscillator, modified Hartley type	27 Sep '63
Vertical output, 2nd half of multivibrator	25 May '65
Vertical sweep, one stage	25 Jan '64
Video amplifier with auto- matic brightness control	25 Feb '64
Video IF, stacked	29 Oct '63
Video-AGC-Sync take-off circuits	27 Feb '65
Video output, contrast con- trol at cathode	27 Feb '63
Video output, contrast con- trol at plate	27 Mar '63

SYNC

See also *HORIZONTAL AND VERTICAL*

Absent, horizontal and vertical	40 Sep '65
Instability	40 Sep '65
Monitoring intermittents	72 Aug '63
Pinpointing trouble	32 Feb '61
Separator waveform and voltage analysis	31 Jun '62
Simplified approach to	30 Sep '64
Transistor circuits	8 Jun '64
Troubleshooting	100 Jun '62
Video contamination	43 Sep '65

TAPE RECORDERS

Adjustment and maintenance of heads	86 May '64
Charges for service	54 Aug '63
Drive belt slippage, eliminating	58 May '65
Heads	30 May '64
Rewind problems	42 Aug '63

Servicing	46 Mar '61
Troubleshooting	25 Aug '65
VOX	38 Aug '63
	36 Oct '65

TELEVISION

Alignment with signal generator	60 Mar '64
Automatic brightness and contrast control	1 Oct '61
Circuit protection devices	58 Sep '64
Conversion of foreign systems	34 Jul '64
Intermittents, servicing	50 Jan '64
Old sets, repairing	36 Oct '63
RF radiation, FCC regulations concerning	58 Apr '62
Test equipment for	38 Mar '63
Transistorized circuits	1 Jun '64
	29 Oct '65
UHF station activity	30 Jan '65
Waveforms save servicing time of	34 May '64

TENT EQUIPMENT MISCELLANEOUS

See also <i>SPECIFIC TYPES</i>	
AC, VTVM, EICO Model 250	64 Feb '62
AC volt-wattmeter, EICO 260	60 Oct '61
Accessory guide	20 Jan '64
Alignment, color TV	47 Nov '65
Availability from various manufacturers	27 Apr '61
Battery eliminators	46 Jun '63
Bench test jig for color	42 Nov '61
Check list of	31 Jan '64
Circuits, general	3 Mar '63
Color TV	
—service accessory, Anchor Model CA-378	92 Nov '62
Communications servicing for	1 Apr '64
Component substitution unit	
—Mercury Model 500	52 May '61
—Precision Apparatus Models 1702 and 1803	66 May '62
—SENCORE Model RC 121	76 Jun '62
Cost and depreciation	94 Mar '65
DC bias source, SENCORE Align-O-Pak	58 Nov '61
DC supply by molecular electronics	56 May '63
EICO Model 488, electronic switch	58 Jan '63
GC Model 36-568, transistor radio troubleshooter	56 Aug '63
Good instruments, advances of	50 Mar '64
Guide for shops	38 Mar '63
Industrial types	36 Mar '63
Kit building, fine points	28 Apr '61
Marker adder, using	82 Mar '63
Meter protection, solid state	2 Jun '65
Microwave	41 Mar '65
Modern bench, for	30 Jan '64
Multimarker for color-TV alignment, RCA WG-295C	95 Jun '62
Power-Line Monitor, RCA Model WV-120A	43 Mar '62
Power-resistor substitution unit, SENCORE Big 20	42 Oct '61
Precision Model P25, transistor radio battery eliminator	54 Apr '63
RF modulator for color-TV alignment, RCA WG-304B	34 Jun '62
Repair your own	32 Mar '65
SWR meter	70 Apr '63

Scope, ringing checks	30 Mar '63
Seco Model 250, Transistor and Tunnel Diode Analyzer	66 Mar '63
SENCORE Model BE124, battery eliminator	50 Sep '63
Signal injector, Eby Signal-Jet	34 Feb '61
Signal injectors, noise- or harmonic- generator type	27 Mar '62
—Don Bosco Stetho-tracer	46 Aug '62
—G-C Electronics Model 36-564	86 Sep '62
Signal-substitution tester	22 Apr '61
—B & K Model 1076 Analyst	44 Jul '61
Simpson Model 407, remote aligner	99 Nov '63
Sound-level indicator, H. H. Scott Model 450	72 Dec '62
Speaker-phasing device, RCA Model WG-360A Phase Checker	62 Feb '62
Special equipment speeds servicing	38 May '63
Specialist, meet two	36 Mar '65
Specialized instruments, guide to	38 Oct '64
Special uses for	42 Mar '63
Specifications, interpreting	26 Apr '61
Trading old for new	93 Mar '65
Transistorized	1 Jun '65
Wattmeter, troubleshooting with	44 Apr '61

TRANSFORMERS AND COILS

Constant-voltage PA systems, for	60 Oct '63
Extension speaker transformer	69 Apr '64
IF's, repairing	26 Dec '61
Horizontal output	42 Jul '62
Square-wave tests of	50 Jun '65
Transistor radios, for	52 Sep '63
—IF's	37 Feb '63
Variable line	64 Feb '65

TRANSISTORS

See also *TRANSISTOR RADIOS*

AGC, auto radio	58 Jan '65
Audio circuits, in	3 Aug '65
Basic shop stock	46 Mar '62
Bias voltages on	37 Feb '63
Circuit fundamentals	36 Sep '65
Construction of	76 Sep '65
DC circuit voltages	86 Mar '62
Digital computers, in	72 Nov '63
Field-effect type	52 Jun '64
Front-to-back resistance of diode sections	83 Mar '62
Ignition systems	30 Feb '64
Impedance matching	81 Sep '65
Industrial equipment, in	68 Nov '63
Lead recognition	32 Jun '64
Leakage, determining	88 Oct '65
Measurements for	68 Nov '63
Oscillator circuits	1 Jun '63
PN junction, current across	54 Mar '62
PNP or NPN, determining	36 Sep '65
Silicon-controlled rectifiers	73 Jun '65
Terminology	32 Jun '64
Test equipment circuits, using	1 Jun '65
Testing	66 Mar '63
	42 Jun '63
	58 Jul '63
	56 Aug '63
—with VOM	54 Sep '63

Unijunction	40 Jul '65
Universal replacements	37 Feb '63
Voltage polarity	32 Jun '64

TRANSISTOR RADIO

Audio and IF stages, checking	35 Oct '64
Audio output stages	26 Dec '63
Batteries for	52 Jun '63
Battery eliminators, for servicing	54 Apr '63
	46 Jun '63
	50 Sep '63
Common troubles in	38 Sep '65
FM defects	98 Oct '65
Guides to importers and manufacturers	22 Jun '65
Miniature sets, servicing	34 Jun '65
Motorboating	31 Jun '63
Oscillation in	70 Jun '64
Oscillator checks	38 Mar '62
Oscillator, circuits	1 Jun '63
Output stage, push-pull	34 Jun '63
Power supply	
—for servicing	56 Jul '63
—servicing with	48 May '63
Printed board repair	40 Jun '65
Replacement parts for	52 Sep '63
Sensitivity, boosting	36 Feb '63
Service bench for	28 Mar '62
Servicing	48 Mar '63
Sound defects	34 Jun '64
Substitute transistors	46 Mar '62
Test connections for power supply	30 Jun '63
Test device for forward bias	31 Jun '63
Test equipment for	26 Mar '62
	38 Mar '63
	56 Aug '63
Tools needed for repair	35 Oct '65
Troubleshooting with a scope	24 Jun '64
Voltage check chart	35 Oct '65

TRANSISTOR TV

Circuit explanation	32 Mar '62
Sweep circuit operation	29 Oct '65

TRANSISTOR TESTERS

B & K Model 960	62 Jan '62
Cross-reference chart	26 Mar '62
EICO Model 680	70 May '62
ESCO Model XT-1	57 Aug '65
GC Model 36-568	56 Aug '63
Heath Model IM30	58 Jul '63
Hickok Model 890	47 Jul '61
How they work	24 Jan '61
Seco Model 250, Transistor and Tunnel Diode Analyzer	66 Mar '63
SENCORE Transimaster	50 May '61
Superior Model 88	65 Feb '61
Triplett Model 3490-A	66 Mar '65
Win-Tronix Model 620	72 Jan '61

TUBES

Burnout	35 Jan '63
—repeat	68 Feb '65
CB-communications tube usage guide	18 May '65
Caddy guide for color servicing	88 Nov '63
Caddy stock	33 Jan '65
Compactron basing diagram	36 Jul '62
Defects easily overlooked	28 Dec '63
Emission, checking	67 Apr '65
European imports	40 Jul '62
Evaluate in-circuit	62 Apr '65
Expiration codes	38 Jan '63
Radio and hi-fi types, stock guide	32 Dec '63
Stock guide for shop and	

caddy	28 Apr '62
	52 Oct '62
Stock guide for TV	78 May '64
TV stock guide	20 Apr '65
TV types, stock guide	76 Apr '63
TV usage guide	33 Jan '65
Testing	60 Aug '63
Voltage dividers, used as	82 Mar '65

TUBE TESTERS

B & K Model 445	58 Apr '64
B & K Model 700	50 Jul '62
Basic types and applications	50 Sep '61
CRT tester and rejuvenator	
Anchor Model T-475	64 Aug '62
GC Electronics 36-540	70 May '64
GC Electronics 36-616	96 Nov '64
Hickok Model 580	52 Apr '65
Hickok Model 752A	59 Aug '63
Jackson Model 825	71 May '65
Mercury Model 202E	54 Oct '65
Mercury Model 301	52 Jul '64
Mercury Model 800	46 Aug '61
Mercury Model 1000	70 Aug '62
Mercury Model 1100	68 May '62
Mercury Model 1101	87 May '65
Mercury Model 1200	76 Oct '62
New types available	34 Mar '65
PACO Model T61	80 Feb '63
Precision Apparatus Model	
650	79 Jun '62
RCA Model WT-115A	64 Mar '65
SENCORE Model CR128	77 Feb '65
SENCORE Model CR133	52 Sep '65
SENCORE Model FC123	
Filcheck	76 Jun '64
SENCORE Model TC131	94 Nov '65
Superior Model 85	54 May '61

TUNERS, TV

Alignment	47 Nov '65
Automatic control of VHF	
oscillator	36 Nov '65
Common troubles	82 May '62
Directory of repair services	80 Sep '61
Motorized, disassembling	34 Feb '63
Repairing	28 May '63
Repairs of	16 Jun '64
Troubleshooting	29 May '63
UHF	36 Mar '64
Universal-replacement types	33 Sep '61

TWO-WAY RADIO

See *COMMUNICATIONS*

UHF TELEVISION

Airborne MPATI system	40 Jan '63
Antennas for	46 Oct '63
FSM's conversion of	32 Mar '64
Legal check list	61 Jan '64
Preparing for	60 Jan '64
Reception considerations	42 Jan '63
Rules regarding	61 Jan '64
Standards Kollsman VHF to	
UHF translator	61 Oct '64
Station activity	30 Jan '65

VERTICAL SWEEP

Bar in raster	34 Jul '61
Blanking network trouble	72 Oct '63
Compressed height	40 May '63
Foldover	36 May '64
Intermittent	44 Sep '63
—creep	38 Oct '63
Jitter	64 Oct '63
Linearity faults	56 Aug '62
	39 Dec '62
Linearity problem	31 May '63
Multivibrator, circuit	
description	42 Sep '63
Signal-injection tests using	

AC line voltage	2 Dec '63
Transistor circuits	4 Jun '64
	29 Oct '65
Transistor receiver, troubles	37 Jun '65
Troubleshooting hints	34 Jan '61
	1 Jan '62

VERTICAL SYNC

Instability	32 Dec '61
Intermittent flipping	75 Feb '62
Isolating trouble	2 Jan '62
Picture jittery	40 Sep '65
	108 Nov '65
Rolling, with critical hold	38 May '63
Transistor sets, troubles in	37 Jun '65
Unstable	66 Jan '65

VIDEO AMPLIFIER AND OUTPUT

Contrast, modifications to	
improve	50 Nov '65
Frequency-response check	26 Jan '62
Interference in sync signal	83 Dec '62
Output-plate signal	44 May '64
Transistor circuits	7 Jun '64
Tube failures	58 May '62

VIDEO SPEED SERVICING

Admiral Chassis 15E1	5 Sep '63
Admiral Chassis 15G1B	7 May '62
Admiral Chassis 18B7	5 Sep '64
Admiral Chassis 20H6	5 June '61
Airline Model WG-5081A	5 Jul '61
Airline Model WG-5200A	7 Dec '61
Airline Model WG-5218A	5 Aug '64
Andrea Chassis BR-T1VW-	
319	5 Sep '65
Andrea Chassis VS-323-1	5 May '61
Coronado Chassis S15	5 Feb '64
DuMont Chassis 120591A	5 Feb '65
DuMont Chassis 120600A	7 May '61
DuMont Chassis 120602A	7 Apr '63
DuMont Chassis 120642	5 Apr '65
Emerson Chassis 120507A	7 Jan '63
Emerson Chassis 120515-C	7 Sep '65
Emerson Chassis 120517E	5 Jan '61
Emerson Chassis 120587A	5 Jul '63
General Electric Chassis QY	5 Jul '65
General Electric Chassis LW	7 Sep '63
General Electric Chassis M6	7 Feb '62
General Electric MW	
Compactrom	7 Sep '64
Hoffman Chassis 356	7 Apr '62
Magnavox 32 Series	5 Aug '61
Magnavox 33 Series	9 Jan '63
Magnavox Chassis V38-01-00	7 Feb '64
Motorola Chassis RTS-433Y	7 Jul '61
Motorola Chassis RTS-568	7 Sep '62
Motorola Chassis TS435	5 May '63
Motorola Chassis TS-567Y	5 Sep '61
Olympic Chassis JB	7 Jun '61
Olympic Chassis JE	7 Jan '61
Olympic Chassis JRW	5 Jul '62
Olympic Model 6P25	7 Jul '65
Packard Bell Chassis 98D8	5 Feb '61
Philco Chassis 10L31	7 Jul '63
Philco Chassis 11H25	7 Sep '61
Philco Chassis 12J27	5 Feb '63
Philco Chassis 12N51	5 Dec '62
Philco Chassis 12N51	5 May '64
Philco Chassis 14M91	7 Apr '65
Philco Chassis 14N50	7 Feb '65
RCA Chassis CTC11	5 Nov '62
RCA Chassis KCS127AE	5 Mar '61
RCA Chassis KCS130A	9 May '62
RCA Chassis KCS131C	7 Feb '63
RCA Chassis KACS136YA	5 May '65
RCA Chassis KCS137A	5 Mar '64
Silvertone Chassis 456.51800	7 Mar '64
Sylvania Chassis 546-1	9 Sep '62
Sylvania Chassis 547-1	7 Aug '61
Sylvania Chassis 555-1	7 May '63

Trav-Ler Chassis 1150-59	9 Feb '62
Trav-Ler Chassis 23K6180F	7 May '64
Westinghouse Chassis	
V-2378	7 Feb '61
Westinghouse Chassis	
V-2378-1	7 Jul '62
Westinghouse Chassis	
V-2412-1	9 Dec '61
Westinghouse Chassis	
V-2414-1	7 Dec '62
Zenith Chassis 14L30	7 May '65
Zenith Chassis 16E21	9 Apr '62
Zenith Chassis 16F28	9 Apr '63
Zenith Chassis 16V25, Q, U	7 Aug '64
Zenith Chassis 16Z27	7 Mar '61
Zenith Chassis 29JC20	7 Nov '62

VOM'S

Calibration	32 Mar '65
Circuits, general	4 Mar '63
Comparing with VTVM	50 Mar '63
Error due to shunt effect	48 Apr '61
Heath Model IM-20, Handy	
Lab	56 Mar '63
Repair, how to	32 Mar '65
Solid-state	5 Jun '65
Triplet Model 630-L	54 Sep '63
Triplet Model 800	64 Jan '62
Unusual applications for	70 Mar '65
VOM-capacity tester, Mercury	
Model 400	60 Feb '61
VOM-VTVM combination,	
SENCORE Service	
Master	56 Sep '61

VTVM'S

B & K Model 375	74 May '62
Circuits, general	5 Mar '63
EMC Model 107A	88 Nov '65
EICO Model 222	51-Jul '62
EICO Model 222	51 Jul '62
EICO Model 250	64 Feb '62
Heath Model IM-13	51 Sep '65
Heath Model IM-21, AC type	79 Oct '63
Hickok Model 209B	64 Aug '64
Hickok Model 470A	60 Oct '64
Jackson Model 805	74 May '64
Maintenance and repair	32 Apr '61
RCA Model WV-98-B(K)	74 Dec '61
Triplet Model 850	62 Oct '61

WAVEFORMS

Analysis for	
—troubleshooting	36 Apr '63
Distortion due to pickup	34 Dec '62
Horizontal AFC	
—balance diode	81 Jun '63
—common cathode	37 Aug '63
—triode	69 Aug '63
Keyed AGC, in	25 Jun '63
Low-cap probe, effect on	35 Mar '63
Measuring	35 Mar '63
Multiplex	54 Jul '64
RF generator	54 Mar '64
Ring checks for coils	30 Mar '63
Square-wave, analysis of	66 Jan '63
Sweep alignment	28 Jan '65
Sweep generator	31 Jan '64
Synchroguide	32 Apr '64
Sync signal	66 Jan '65
Television test points	30 Aug '63
Test signals for color	33, 100 Nov '63
Understanding	33 Feb '65
Within oscilloscope	48, 52 Jul '63

YOKES

Crosstalk	42 May '63
General information on	42 Jul '62
Linearity magnet replacement	34 Sep '63
Pincushion distortion	37 Feb '65
Shorted winding	3 Jan '65
Stock guide	20 Feb '64

INDEX TO TITLES

Ten-Year Subject Reference Index	41 Jan '61
1961 PF REPORTER Subject Reference Index	37 Jan '62
1962 PF REPORTER Subject Reference Index	36 Jan '63
1963 PF REPORTER Subject Reference Index	71 Dec '63
1964 PF REPORTER Subject Reference Index	1 Dec '64
1965 PF REPORTER Subject Reference Index	1 Dec '65

ANTENNAS

Analyzing Closed-Loop Systems	50 Dec '62
Antenna-Equipment Review	30 Aug '62
Antenna Installation News	37 Feb '61
Antennas for Stereo FM	34 Aug '62
Antenna Systems Can be Safe	39 Aug '64
Boosting and Distributing UHF and VHF Signals	32 Aug '64
Guide to Communications Antennas	76 Apr '64
Installing Master Antenna Systems	28 Aug '62
Let's Have A Look at Antenna Preamps	34 Apr '62
Maintenance of Antennas & Towers	30 Jul '65
Master Antenna Systems	30 Aug '64
New Form of UHF-TV Antenna	46 Jul '65
Overcoming Wind-Load Effects	27 Jul '65
Phasing Multiple-Antenna Systems	24 Jul '65
Repairing Amplified Antennas	44 Apr '65
Right Way to Install Antennas	30 Feb '62
Rotator Maintenance and Troubleshooting	24 Aug '62
Sizing Up Antennas	56 Apr '63
Spotting Antenna Failures. Quickly	44 Apr '63
Techniques For Selling Antennas	56 Aug '64
There's Big Money in Antenna-System Business	44 Dec '61
UHF Antennas for 1965	32 Jul '65
UHF Antennas—New Boom Ahead?	46 Oct '63

AUDIO

Acoustics Can Be Measured	36 Aug '65
Analyzing Automatic Changer Mechanisms	1 Aug '63
Approach to Custom Hi-Fi	32 May '62
The Audio Circuit—Simple?	36 Sep '63
Audio Servicing From A to Z	1 Aug '65
Audio Testing & Measurements	50 Mar '65
Care and Choosing of Tape Heads	30 May '64
Chasing Faults in Intercoms	61 Sep '65
Custom Stereo Simplified	56 May '64
Find Profit in Small Tape Recorders	55 Dec '64
Fixing Record Changers Is A Cinch	34 Oct '62
Howell Company's All Taped Up	38 Apr '62

Hum-Hunting in Audio Equipment	42 Jan '62
Intercoms With All the Extras	34 Aug '63
Keep It Clean	29 Aug '65
Latest in Hi-Fi: Reverberation	38 Jan '61
Make Room for Speakers	48 Feb '63
New Sound From Old Cabinets	34 Oct '64
Phono Cartridge and Needle Replacement Guide	38 Oct '61
Planning Intercom Installations	34 Oct '61
Profits From PA Systems	54 Oct '63
Putting Silent Sound to Work	74 Apr '62
Renting Sound Equipment Leads to Sales	38 Sep '61
Replacing the Phono Needle	32 Aug '63
Servicing Tape Recorders	46 Mar '61
Sly Old VOX (Recorder) The	36 Oct '65
Special Distortion Tests for Hi-Fi Amplifiers	32 Aug '62
Tape Recorders Yield to A Direct Approach	38 Aug '63
Techniques of Distortion Chasing	38 Sep '64
What You Should Know About Speakers	27 May '61

BUSINESS

ASCAP & BMI	50 Aug '65
Answering Customer's Color Questions	52 Oct '62
Arbitrating Problems of CB-TV	68 May '65
Audio-Sideline or Main Line?	72 Sep '64
Blueprints for Service Benches	40 Apr '62
Blueprints for Service Benches (part 2)	36 Jun '62
Books As A Service Tool	52 Jan '65
Burglars-Eye View of Service Shops	62 Dec '61
Business Forms Boost Efficiency	36 Jun '61
Can An Accountant Help You?	32 Dec '65
Choosing New Lines of Business	44 Jun '64
Common Blunders in Handling Credit	48 Aug '63
Cost of Doing Business	66 Apr '62
Death Stalks the Rooftop	56 Sep '64
Developing Your Home-Call Techniques	64 Sep '61
Does Your Customer Record File Cost or Pay	38 Sep '62
Estimates Can Be Profitable	46 Dec '63
Expanding Into TV Sales	46 May '61
Floor Plans for Service Shop	1 Jan '64
Free Tube Testing—At A Profit	62 Oct '62
Getting Into the Background Music Business	28 Feb '62
Getting More From Your Test Equipment	42 Mar '63
Getting Ready for UHF	60 Jan '64
Good Test Equipment Doesn't Cost . . . it Pays	50 Mar '64
Guaranteeing Your Service Work	58 May '63
Guide to Phono-Tape Charges	54 Aug '63

Handling Credit on Your Own	58 Jun '62
Handling While-U-Wait Service	55 Jun '63
Here's A Shop That Specializes in Everything	36 May '62
High Cost of Employee Theft	42 Jul '64
Home-Call Sales Techniques	40 Jul '61
How to Extend Credit Without Going Broke	40 May '62
How to Find A Serviceman	64 Sep '63
How to Handle Transistor-Radio Customers	48 Mar '62
How to Save Dollars On Your Federal Income Tax	42 Feb '62
How to Select Test Equipment	26 Apr '61
Interpreting Your Inventory	42 Nov '62
Is Your Insurance up to Date?	68 Jan '64
Keeping Your Service Sold	18 Jul '63
Let the Customer Have Your Way	21 Feb '61
Make Money in Rentals, Sales, Leases	24 Aug '65
Make the Most of Your Attorney	48 Oct '64
Minimizing Income-Tax Problems	38 Feb '63
Profit From Flat-Rate Service Calls	42 Dec '62
Putting the Lid on Overhead	40 Aug '61
Raise the Efficiency of Your Service Operation	50 Jan '62
Receiver Extraordinary	66 May '64
Sales Tips for New & Used TV	49 Oct '65
Service Bench Designs—Buy Them or Build Them	28 Sep '61
Service Promotions That Work	54 Nov '61
Service Shop 1974	36 Jan '64
Service Vehicles—Buy or Lease	44 Oct '61
Simplified Inventory-Control Systems That Work	20 Mar '61
Small Appliances—A Service Sideline	22 Feb '63
Smoothing Business Peaks and Slumps	26 Apr '63
Solving the Unclaimed Merchandise Problem	56 Dec '61
Summer Service Promotions	30 Jul '62
Survey of Upgrading Courses	54 Feb '61
TV Service-Charge Survey	40 Dec '61
Trade Old Test Equipment for New	93 Mar '65
Training Systems for Modern Technicians	30 Sep '65
You Can Manage for Profit	48 Apr '64
You Can Modernize Your Service Business	44 Jan '64
Your Investment in Color TV	48 Aug '62

COLOR TV

ABC's of Convergence	32 Sep '64
AFC for Color Tuners	36 Nov '65
A Study of Luminance Channels	40 Nov '64
Analysis of Color-TV Waveforms	38 Nov '65
Automatic Degaussing	48 Sep '65
Blunderful World of Color	56 Nov '64

Bout With A Color Set	32 Nov '61	Tips for Color Servicing	78 Nov '64	Characteristics	30 May '65
CCTV in Color	36 Nov '63	Tracing Color Signals	36 Nov '64	Using Communications Test	
Caddy Guide for Color-TV		Tracking Gray-Scale in New		Equipment	30 Apr '61
Servicing	88 Nov '63	Color Sets	33 Sep '65	Where Stands CB with	
Chroma Bandpass and		Troubleshooting High-Voltage		FCC?	44 May '65
Demodulator Circuits	26 Nov '61	Regulators	62 May '65	Wire-Line Remotes for	
Chroma Demodulator and		Understanding Color Sync	46 Nov '61	Two-Way	64 Jan '64
Matrix Stages	32 Nov '62	Using Color Generators	38 Mar '65		
Chroma Reference and		Vertical Problems and			
Control Circuits	48 Nov '64	Convergence	52 Nov '63		
Collection of Color TV		Visual Symptoms Tell A			
Troubles	40 Nov '65	Story	38 Dec '62		
Color-Alignment Setups	34 Jun '62	What's New in Color TV	34 Nov '61		
Color by Kit	97 Nov '65				
Color . . . It's Easy if You		COMMUNICATIONS			
Keep Calm	58 Nov '63	Audio Clippers in Communi-			
Color Parts Guide	22 Feb '65	cations	44 Oct '63		
Color Questions and Answers		Breaking the Commercial			
Then and Now	66 Nov '64	Sound Barrier	22 Jun '61		
Colors Adrift? Check		CB for Industrial			
Color Sync	32 Sep '62	Communication	98 Apr '64		
Color Servicing In the Home		Communications Service			
36 Nov '61		Pricing Guide	26 Jun '62		
Color Symptom Clues	38 Nov '63	Communications Tower			
Color TV Crossword	88 Nov '61	Maintenance	86 Oct '64		
Coldr-TV Service Aids	24 Nov '62	Crystals for Communications			
Color-TV Service-Charge		38 Jun '62			
Guide	50 Nov '62	Curing Aircraft Radio			
Color Technicians Casebook		Problems	34 Sep '64		
67 Nov '65		Curing Aircraft Radio			
Corona—In the Cage and		Problems, Part 2	34 Dec '64		
Out	70 Nov '62	Extend 2-Way Range—			
Cures for Color Hue		Reduce Noise	23 Dec '65		
Troubles	46 May '64	Field Servicing Two-Way			
Experience With A Color		Radio	40 Mar '64		
Set	30 Jul '61	Finding & Keeping CB			
Fundamentals of the Color		Customers	58 Feb '65		
TV System	1 Nov '61	Frequency Synthesis	86 Apr '64		
Guideposts to Color		Imperfect Squelch	32 Jun '62		
Servicing	28 Nov '65	Installing A CB Mobile			
Guide to Color-Set		Unit	32 May '65		
Chassis Layout	32 Nov '65	Installing Communications			
Home Servicing by Picture		Antennas	38 Apr '63		
Symptoms	41 Jul '65	Maximum Efficiency From			
How's Color TV Doing	62 Nov '62	CB	50 Jun '62		
How to Converge the New		The Misaligned RF Stag	78 Apr '64		
Color Sets	32 Jan '61	Mobile-Installation			
Instruments Simply Color		Know-How	28 Jun '62		
Tough-Dogs	68 Mar '64	Mobile Radio, Transistor			
Isolating Chroma Troubles		Style	30 Mar '62		
by Symptoms	28 Nov '61	Modulation Limiters for			
Know Your '63 Color Circuits		Two-Way	92 Apr '64		
(Chroma Bandpass)	32 Jan '63	Multiband Receivers With			
Know Your '63 Color Circuits		Alignment Faults	34 Dec '63		
(Color Sync)	38 Sep '63	New Rules Spur Business			
Know Your '63 Color Circuits		Use of CB	62 Jan '65		
(Convergence Panel)	32 May '63	Preparing for the Second-			
Know Your '63 Color Circuits		Class Phone Exam	22 Sep '61		
(Horizontal Sweep & High		Radio Amateurs Aren't So			
Voltage)	34 Apr '63	Bad!	78 Sep '64		
Know Your '65 Color		Radio Paging	72 Jul '64		
Circuits	1 Nov '64	Rebuilding Carbon Mikes	82 Oct '64		
Know Your '66 Color		Removing the Mystery From			
Look Inside A Color-TV		Modulators	68 Jul '64		
Circuits	1 Nov '65	Selective Calling Ends Hubbub			
Station	38 Nov '62	in Mobile Radio	34 Feb '62		
Making Color Servicing		Service Dealer and the			
Big Business	44 Nov '65	CB Market	30 May '61		
Meet A Color-TV Specialist	36 Nov '62	Servicing Tone-Coded			
Objective: Pure White	34 Nov '62	Squelch	58 Sep '62		
Overall Alignment in		Test Setups for Servicing			
Color Receivers	47 Nov '65	Two-Way Radio	42 Dec '61		
Overcoming "Coloritis"	22 Mar '61	Transistorized Mikes for			
Quick Ways of Chroma		Mobiles	66 Jul '64		
Alignment	38 Nov '64	Transistor Power Supplies			
Replacing a Color CRT	42 Nov '64	for Two-Way	88 Oct '64		
Starting A Color		Tuning HF Transmitters	32 Feb '63		
Servicing Business	40 Nov '63	Two-Way Radio Antennas	22 Jul '61		
Ten Years of Color/A		Two-Way Radio Expedites			
Report	99 Nov '64	Service	50 Jan '63		
		Unusual CB Alignment			

COMPONENTS, TOOLS, PRODUCTS

A New Look in Printed	
Components	72 Sep '63
Battery Eliminators—	
Instant DC	46 Jun '63
CRT Brighteners—Color	
and Monochrome	76 Nov '63
Diode and Rectifier	
Replacement Guide	32 Jul '61
Finding the Right	
Alignment Tool	38 Oct '62
Fusible Resistor Cross-	
Reference Guide	75 Dec '62
Guide to Fusible Resistors	55 Dec '65
Handling IF-Transformer	
Troubles	26 Dec '61
Practical Capacitor Testing	
and Replacement	28 Aug '61
Replacement Parts for	
Transistor Radios	24 Jan '62
Resistors With More Than	
One Job	20 May '63
Sizes, Functions and Facts	
About Small Value	
Capacitors	36 Apr '64
Testing 3-Terminal Networks	
33 Aug '65	
Tools—Extra Hands for	
Busy Techs	88 Mar '65
Transformer Tactics	44 Sep '62
Unwinding the Mystery	
of Coils	34 Apr '65

MISCELLANEOUS

A Busy Decade in Review	30 Jan '61
Adhesives for Service Jobs	
52 May '65	
Aerosols in Servicing	
Chemicals	36 Jul '64
Air-Conditioner Repair	
Made Easy	24 Jun '61
Binary Numbers Are Not	
Complicated	28 Jul '62
CATV Revisited	42 Feb '65
Circuit Tracing Printed	
Boards	58 Dec '62
Circuit Voltages Tell the	
Story	32 Dec '61
Closed-Circuit TV Is	
Opening Up	30 Oct '62
Easier PC-Board Repairs	26 Jul '62
Effective Use of Service	
Chemicals	30 May '62
Electronics in the Dark	
Room	32 Jan '64
Finding Test Points on	
Printed Boards	30 Dec '65
Getting More Out of Resistance	
Measurements	22 Oct '62
Hi-Ho Come to the Fair	1 Jul '64
Highlights of 1962 TV Lines	
1 Oct '61	
Highlights of 1963 TV Lines	
1 Oct '62	
Highlights of 1964 TV Lines	
1 Oct '63	
Highlights of 1965 TV Lines	
1 Oct '64	
Highlights of 1966 TV Lines	
1 Oct '65	
How to Strip and Solder	
Cables	40 Apr '63
Instruments for Microwave	
Servicing	41 Mar '65
Introducing Zenith's 25"	
Color	38 Jun '65
Knack of Filter Replacement	
52 Dec '64	

MPATI at Midterm	40 Jan '63
Measuring Lo-Q Inductances	32 Dec '64
Molecular Electronics Explained	50 May '63
Photoelectric Control Circuits	28 Jul '61
Professional Touch in Kit Building	28 Apr '61
Radar Maintenance Is Easy—Part 1	38 Feb '65
Radar Maintenance Is Easy—Part 2	38 Apr '65
Radar Maintenance Is Easy—Part 3	72 Jul '65
Radio-TV Service Puzzle	94 Jun '62
Radio-TV Substitution Stock Guide	22 Sep '62
Repairing Etched Circuit Boards	40 Jun '65
Repairing Small Appliances	30 Aug '61
Report on the New York UHF Test	34 May '62
Report on UHF Station Activity	30 Jan '65
School Room TV Takes to the Air	36 Oct '61
Servicing Is Fun	50 Sep '62
Square-Wave Testing for Inductors	50 Jun '65
Square-Wave Testing in Resistive Circuits	37 May '65
Square-Wave Testing of Capacitors	36 Jul '65
Square-Wave Tests for 3-Terminal Networks	30 Oct '65
Square-Wave Tests for 3-Terminal Networks	18 Dec '65
State-of-Art Report on Color TV	52 Nov '65
Tracing B+ Feed Paths	34 May '65
Trends in Electronic Importing	46 Sep '65
Troubleshooting In A Small Plant	30 Dec '63
12 Years of UHF	16 Dec '65
UHF Tuners Inside and Out	34 Mar '64
Understanding Infrared Energy	26 Oct '63
Understanding Pads & Attenuators	32 Oct '65
Unusual Faults in Filament Circuits	34 Jan '63
Voltage Division and How It Works	52 Feb '65
Watch A Schematic in the Making	52 Oct '65
When Cable TV Comes to Town	36 Jul '63
When Replacement Parts Don't Quite Fit	34 Sep '63
The Wraps Are Off Motorola Color	30 Jul '63

RADIO

AM-FM Auto Sets Are Here	26 Jul '63
A Sensible Parts Stock for Transistor Radios	52 Sep '63
Applied Reasoning for Auto Sets	42 Oct '64
Boosting Sensitivity in Transistor Portables	36 Feb '63
Case Book for Transistor Techs	34 Jun '64
Curing Blindness in FM Tuning Eyes	32 May '64

Curing Buzz, Hum, & Other Irritating Noises	26 Jan '65
FM Stereo and the Serviceman	38 Dec '61
Guide to Importers	38 Jun '64
Hybrids on the Auto Bench	56 Apr '65
Keep AM-FM Portables Working	34 Oct '65
Key to Stereo Alignment	30 Jul '64
Latest Circuits for FM Stereo	38 Oct '65
Meet an Auto Radio Specialist	34 Apr '64
Microservicing in Pocket Portables	34 Jun '65
Output-Transistor Failures in Auto Radios	40 Jun '61
Radio Battery Guide	52 Jun '63
Repair Super Hets in Mintues	38 Aug '62
Scoping in Transistor Radios	24 Jun '64
Search Tuners in Auto Radios	22 Jul '62
Servicing Auto-Radio AGC	58 Jan '65
Servicing Imported Transistor Portables	24 Jul '61
Servicing Stereo Adapters	42 Dec '64
Short Cuts That Waste Time	32 Jul '64
Shortcuts Through Transportable Car Radios	42 Jun '65
Six Steps to Quicker Transistor-Radio Repairs	34 Mar '62
Source Guide to Manufacturers & Importers, Transistor Radios	22 Jun '65
Stereo FM Report	26 Dec '62
Tracking Adjustments for AM-FM	32 Feb '65
What's Different About FM Radio Servicing	48 Feb '62
You Can Fix Small Radios	18 Feb '61

SERVICING TV

AGC Filter & Distribution Faults	31 Aug '65
AGC Servicing Magic	32 Apr '65
AGC Troubles and Solutions	28 Sep '64
Automatic Brightness and Contrast Control	36 Apr '62
Bars and Stripes in Rasters	36 Apr '63
Beware the Vertical Creep!	38 Oct '63
Blast Those TV Intermittents	26 Oct '61
Case of the Ten-Minute Fuses	20 May '61
Chasing Intermittent Sweep	42 Sep '63
Checking Up on Video Amplifiers	26 Jan '62
Cheerful Charlie's Tribulations	62 Oct '63
Cheerful Charlie Foils the DIY's (Do-it-yourselfers)	40 Apr '64
Coping With Callbacks	52 Apr '62
Curbing TV Radiation	58 Apr '62
Debugging B+	24 Sep '62
Eliminating TV Buzz	30 Jun '61
Eliminating TVI	28 Jan '62
Excessive AGC Leads to Wild Goose Chase	28 Jan '61
Filter Buzz	50 Feb '65
Final Scope Checks Reduce TV Callbacks	18 Jun '61
Finding & Curing RF Interference	34 Jul '65
Focusing On the Trouble	26 Jan '63
Fooled by Poor Boost	36 May '64
Foreign TV Systems	34 Jul '64
Freak Rasters and Their	

Causes	32 Apr '62
Getting Rid of the "Christmas Tree"	30 Jan '62
Got the Jitters	40 Dec '62
Have Raster—No Pix	62 Jan '61
Horizontal Oscillator Running Wild	26 Aug '62
Horizontal Troubleshooting From A to Z	1 Jan '65
Hot Roasted Intermittents	50 Jan '64
How Radiation Distorts Scope Traces	34 Dec '62
Improving Retrace Blanking	38 May '64
Improving TV Receivers	50 Nov '65
Ironing out Vertical Sweep Distortion	56 Aug '62
Is An Old TV Worth Repairing?	36 Oct '63
Kill Those Callbacks	48 Dec '64
Know Your Yokes and Flybacks	42 Jul '62
Let's Analyze Troubleshooting	34 Nov '63
Linear Sweep for Flat CRT's	36 Feb '65
Localizing IF Regeneration	28 Jul '63
Making Money With Tinyvision Receivers	28 Oct '65
Monitoring Helps Spot Intermittents	30 Aug '63
More Visual Symptoms Tell A Story	30 May '63
Multiple Troubles Again	20 Jan '62
Noise Inverters in Action	32 May '61
Old Faithfuls of the Bench	24 Apr '61
Operation Vertical	34 Jan '61
Operation Vertical (Part 2)	26 Feb '61
Painless TV Alignment	32 Oct '61
Pinpointing Yoke and Flyback Troubles	39 May '61
Problem: Width & Horizontal Linearity	36 Oct '64
Programmed Troubleshooting	1 Dec '63
Recovering From the Bends	18 Mar '61
Restoring Horizontal Sweep	36 Feb '62
Ringin' Checks for Sweep Coils	30 Mar '63
Scoping Common-Cathode Horizontal AFC	36 Aug '63
Secret Source of Low B+	28 Mar '61
Selecting A CRT Replacement	22 May '61
Service Case Stock Guide	14 Feb '63
Servicing TV With VTVM or VOM	28 Mar '64
Servicing Transistorized TV Circuits	32 Mar '62
Servicing Vertical Sweep in Transistor Sets	36 Jun '65
Shadowing A Shadow	34 Jul '61
Shrunken Rasters	32 Oct '64
Silence That Intercarrier Buzz	20 Jul '62
Smoothing Out the Piecrust	40 Oct '61
Snowed Under by an RCA KCS68C	28 Feb '61
Solving Slow Warm-Up Problems	22 Aug '61
Speaking of Stable Sync	30 Jun '62
Standup of the Intermittent	26 Dec '65
Synchroguide—From Squegs to Squeals	54 Oct '62
Sync Simplified	30 Sep '64
Sync System Service Suggestions	39 Sep '65
TV Circuit Protection Devices	58 Sep '64
TV Fuse Stock Guide	34 Jul '63

TV Tuners—Repair or Replace	32 Sep '61
TV-Tuner Troubleshooting Techniques	26 May '62
TV Waveforms Save Analysis Time	34 May '64
They're Transistorizing TV Remotes	32 Oct '62
Tough Dogs in Synchroguides	32 Apr '64
Tough Dogs Lose Their Bite	30 Feb '63
Track Down That Visible Hum	40 Sep '61
Track Down Those TV Signal Losses	48 May '62
Troubleshooting Diode AFC Systems	66 Dec '61
Troubleshooting TV Wireless Remotes	20 Jun '61
Tuner Repairs Made Easy	28 May '63
Unlocking Secrets of TV Alignment	72 Oct '65
Unscrambling Horizontal-AFC Problems	28 Jun '63
Vertical Sweep Troubleshooting From A to Z	1 Jan '62
Wanted: Pix—Must be Steady	30 Feb '61
Watch Out for Twisters	34 Oct '63
Waveforms for Sweep Alignment	28 Jan '65
Waveforms Save Analysis Time	34 Feb '65
Weak, Washed-Out Pix	28 Oct '62
What? A Wattmeter for Servicing TV?	44 Apr '61
What's Wrong with This Waveform	66 Jan '65
What to Do When the Fuse Blows	18 Jul '62
Where Did the Boost Go	32 Aug '61
Yoke Trouble Plus	30 Sep '61

SPECIAL EQUIPMENT

Advanced Techniques for Future Servicing	36 Apr '65
Disassembling Motorized TV-Tuners	34 Feb '63
Electronic Control of Lighting	50 Oct '61
Electronic Depth Finders	26 Jun '61
Learning About Triggered-Sweep Scopes	99 Mar '65
More on the Universal Test Set	82 Jun '62
Servicing Electronic Musical Instruments	34 Aug '64
Servicing Electronic Photoflash Equipment	44 Feb '61
Servicing Electrostatic Air Cleaners	46 Aug '64
Special Analyzers for TV Troubleshooting	22 Apr '61
Special Equipment Speeds Servicing	38 May '63
Synchros and Servos Systems	36 Jan '61
Testing Magnetic Amplifiers	81 Oct '62
Transistorized Garage-Door Openers Build Profits	32 Jun '63
Translators Bring New TV Horizons	26 Aug '61
Troubleshooting Synchro Systems	26 Mar '61
Variable Line Transformer As A Troubleshooting Aid	64 Feb '65

TEST EQUIPMENT

A Key to Test-Equipment Circuits	3 Mar '63
Aligning TV With a Signal Generator	60 Mar '64
Alignment Equipment for Stereo FM	32 Mar '63
Alignment Techniques for Two-Way	1 Apr '64
Calibrate Your Own Scopes, and Generators	36 Dec '62
Calibrate Your Own Voltmeters	28 Sep '62
Checking Phase of Color Bar Generators	32 Nov '64
Color Instruments for 1964	90 Nov '64
Color TV Test Generators	32 Nov '63
Converting FSM's For UHF	32 Mar '64
Curing Troubles in AM-RF Generators	54 Mar '64
DC Scope for Quick Analysis	30 Mar '64
Develop Your Own Tube-Test Data	82 Apr '62
Do You Really Have the Test Equipment	34 Apr '61
Getting the Most from Your VTVM	32 Apr '61
Good Generator Sweeps Clean	30 Sep '62
Guide to Accessory Probes	60 Mar '65
Guide to Unusual Test Equipment	38 Oct '64
How Many Uses for A VOM	70 Mar '65
Industrial Electronic Test Equipment	52 Apr '61
Industry Uses Unique Test Equipment	36 Mar '63
Keeping Your Test Equipment Modern	74 Mar '63
Meet A Test Equipment Specialist	36 Mar '65
Modernizing Your Scope	1 Mar '65
New CRT & Tube Testers	34 Mar '65
Pitfalls in Meter Readings	48 Apr '61
Repair and Improve Your Scope	48 Jul '63
Repair Your Own Test Equipment	32 Mar '65
Scope Skills	34 Mar '63
Solid-State Circuits in Test Equipment	1 Jun '65
Speedier Servicing With A Scope	32 Feb '62
Test Equipment Accessory Guide	20 Jan '64
Test Equipment Crossword Puzzle	42 Apr '61
Test Equipment for Audio Servicing	26 Sep '61
Test Equipment for Color TV	30 Nov '61
Test Equipment For The Modern Bench	30 Jan '64
Test Equipment for Troubleshooting Transistor Radios	26 Mar '62
Test Equipment Guide for Shops	38 Mar '63
Test Equipment On Parade	86 Mar '64
Understanding Transistor Testers	24 Jan '61
Using A Tube Tester to Advantage	50 Sep '61
Voltage Measurement With A Scope	34 Jan '64

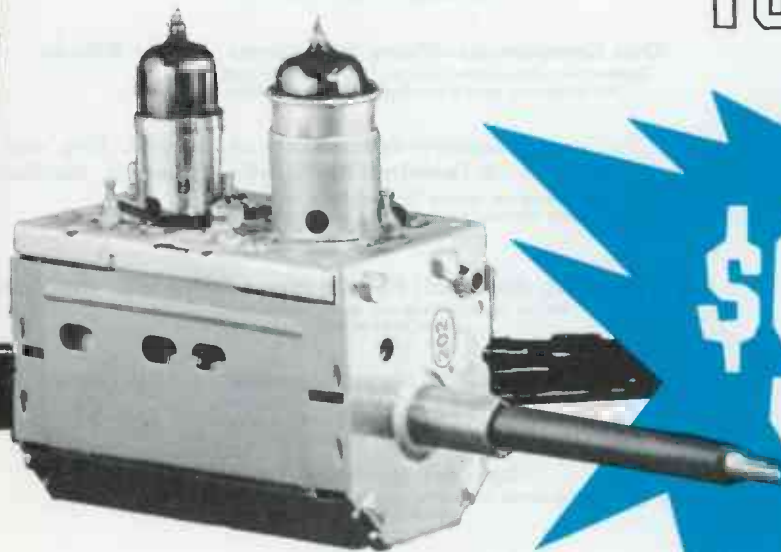
TRANSISTORS & APPLICATIONS

Field Effect Transistor	52 Jun '64
How Transistor Amplifiers Work	36 Sep '65
Industrial Semiconductors at Work	56 Jun '64
Know Your Transistor Circuits	3 Mar '62
Making Transistor Outputs Easy to Understand	26 Dec '63
Me? Do Transistor Servicing?	32 Jun '64
Meet A Transistor-Radio Service Specialist	28 Mar '62
Meet the . . . Istor Family	76 Oct '65
Power vs Signal in Transistors	36 Jun '63
Revolution in Auto Radio—Transistors Are Taking Over	24 Mar '62
Shorting the Way for Transistor Replacements	24 Aug '61
Solid-State Diodes in TV	26 Jan '61
Solid-State RF Circuits	76 Sep '65
Solid State Rectifiers Come of Age	36 Sep '64
Solid-State Relays for Industry	54 Jun '65
Solid State TV Circuits From A to Z	1 Jun '64
Stereo With Transistors	26 Aug '65
Testing Transistors	66 Jun '62
Transistor Circuits in Industry	68 Nov '63
Transistorized UHF Tuners	64 Sep '64
Transistor Oscillators From A to Z	1 Jun '63
Transistors in Hi-Fi	32 Sep '63
Transistor-Tailored Techniques	24 Mar '61
Troubleshoot Transistors by Current Drain	30 Jun '63
Tunnel Diodes: Semiconductors With Negative Resistance	54 Mar '62
Update Your Basic Transistor Stock	46 Mar '62
You Can Service Transistors With A VOM	48 Mar '63
Zeners, Tunnels, Mesas—So What's New	46 Jun '65

TUBES

Guide to A Basic CRT Inventory	24 Jul '62
In-Circuit Tests Evaluate Tubes	62 Apr '65
Just A Tube . . . After All	28 Dec '63
New Ideas in Tube Design	24 Sep '61
Royal Road to Transistor Servicing	36 Dec '64
63-64 TV Tube Usage Guide	33 Jan '65
Stock Guide for TV Tubes	20 Apr '65
Stock Guide for TV Tubes	34 May '61
Stock Guide for TV Tubes	28 Oct '61
Stock Guide for TV Tubes	28 Apr '62
Stock Guide for TV Tubes	52 Oct '62
Stock Guide for TV Tubes	78 May '64
Stock Guide of Communications Tubes	60 Feb '62
Stock Guide of Communications Tubes	18 May '65
Stock Guide to Radio-Hi Fi Tubes	20 Dec '64
Sure Cures for Repeat Tube Burnout	56 May '62
TV Tube Trends	36 Jul '62
Tube Expiration Code Guide	38 Jan '63
Tubes As Voltage Dividers	82 Mar '65

Complete TUNER REPAIR for only



\$9.50

Sarkes Tarzian, Inc., largest manufacturer of TV and FM tuners, offers unexcelled tuner overhaul and factory-supervised repair service. Completely-equipped and conveniently-located Service Centers offer fast, dependable and factory-supervised repair service on all makes and models. Centers are staffed by well trained technicians, assisted by engineering personnel.

Tarzian-made tuners received one day will be repaired and shipped out the next. More time may be required on other makes. Every channel—not just the channels existing in any given area—is checked and re-aligned per orig-

inal specifications. Exclusive cleaning method makes the tuner look—as well as operate—like new.

Cost, including ALL labor and parts (except tubes) is only \$9.50 and \$15 for UV combinations. No additional charge. No hidden costs. Too, you get a full, 12-month warranty against defective workmanship and parts failure due to normal usage.

Always send TV make, chassis and Model number with faulty tuner. Check with your local distributor for Sarkes Tarzian replacement tuners, parts or repair service. Or, use the address nearest you for fast, factory-supervised repair service.

TUNER SERVICE



CORPORATION

*(Factory-supervised tuner service authorized
by Sarkes Tarzian, Inc.)*

547-49 Tonnele Avenue, Jersey City, N.J.
Tel: 201-792-3730

SARKES



TARZIAN

TUNER SERVICE DIVISION

537 S. Walnut Street, Bloomington, Indiana
Tel: 812-332-6055

WEST—10654 Magnolia Blvd., N. Hollywood, Calif.
Tel: 213-769-2720

MANUFACTURERS OF TUNERS, SEMICONDUCTORS, AIR TRIMMERS, FM RADIOS, AM-FM RADIOS, AUDIO TAPE and BROADCAST EQUIPMENT

Circle 2 on literature card

January, 1966/PF REPORTER 17

PF Reporter™

PHOTOFACT

the magazine of electronic servicing

VOLUME 16, No. 1

JANUARY, 1966

CONTENTS

5-Year Subject-Reference Index	1
Letters to the Editor	22
The Electronic Scanner	23
One Component—Many Symptoms Mickey Roberts	28
<small>Quicker Servicing—Save time—Study the defects and the schematic before you begin troubleshooting.</small>	
Square-Wave Tests of 3-Terminal Networks David I. King and Robert G. Middleton	30
<small>Advanced Service Techniques—A review of facts already discussed plus an introduction to checking an entire stage.</small>	
Repairing the Small Record Player Homer L. Davidson	33
<small>Service hints to help you complete the job more quickly and profitably.</small>	
Lasers You May Encounter William Nelson	36
<small>Industrial Electronics—Some light is shed on recent devices in use throughout the electronic industry.</small>	
Uses for Electrical Tape James Welch	39
<small>Performance can sometimes be improved with these home-made remedies.</small>	
Symfact®: Horizontal Oscillator	43
<small>See what happens to voltages and waveforms when troubles occur.</small>	
Notes on Test Equipment Arnold E. Cly	60
<small>Lab report on the SENCORE Model FS134 Field-Strength Meter.</small>	
Color Countermeasures	74
Book Review	81
Guide to TV Fuses	83
The Troubleshooter	84
Solution to December Puzzle	86
Product Report	87
Free Catalog and Literature Service	92
Monthly Index on Free Literature Card	

publisher

Howard W. Sams
general manager
Donald W. Bradley

editor

William E. Burke
managing editor
James M. Moore

ass't to the editor
Norman D. Tonner

associate editors
Arnold E. Cly
David I. King

consulting editors
Joe A. Groves
C. P. Oliphant

research librarian
Bonny Howland

production manager
Esther M. Rainey

circulation manager
Pat Tidd

art directors

Louis J. Bos, Jr. & Robert W. Reed

photography

Paul Cornelius, Jr.

advertising sales offices

Hugh Wallace, advertising sales manager

midwestern

Roy Henry

Howard W. Sams & Co., Inc. 4300 West 62nd St.,
Indianapolis, Ind., 46206
291-3100

central

Paul Houston

Howard W. Sams & Co., Inc. 4300 West 62nd St.,
Indianapolis, Ind., 46206
291-3100

eastern

Gregory C. Masefield

Howard W. Sams & Co., Inc. 3 West 57th St.
New York 19, New York
MU 8-6350

southwestern

C. H. (Jake) Stockwell

C. H. Stockwell Co., 4916 West 64th St.
Mission, Kansas, RA 2-4417

western

Los Angeles Office

G. R. (Jerry) Holtz

The Maurice A. Kimball Co., Inc.
2008 West Carson St., Suites 203-204
Torrance, Calif., 90501
320-2204

San Francisco Office

The Maurice A. Kimball Co., Inc.
580 Market St., Room 400
San Francisco 4, California
EX 2-3365

Address all correspondence to PF REPORTER,
4300 W. 62nd Street, Indianapolis, Indiana 46206



Copyright © 1966 by Howard W. Sams & Co., Inc.
PF REPORTER is a trademark of Howard W. Sams & Co., Inc. No part of PF REPORTER may be reproduced without written permission. No patent liability is assumed with respect to use of information herein. Acceptance of advertising does not in any manner signify the products, policies and services so advertised have been approved, endorsed or recommended by this magazine.
Subscription Prices: 1 year—\$5.00, 2 years—\$8.00, 3 years—\$10.00, in the U. S. A., its possessions and Canada. All other foreign countries: 1 year—\$6.00, 2 years—\$10.00, 3 years—\$13.00. Single copy 50¢; back copies 65¢

Indexed in Lectrodex.
Printed by the Waldemar Press Div.
of Howard W. Sams & Co., Inc.

ABOUT THE COVER

Small, inexpensive record players such as those shown on our cover can mean a significant increase in the overall volume of your service work. The article starting on page 33 gives many hints for repairing these units more quickly and thus at a greater profit.



KWIKETTE* SOLDIERING AIDS...

the revolutionary new connectors
that make **QUICK** work of parts replacement!

WIRE + FLUX + SOLDER, ALL in One!

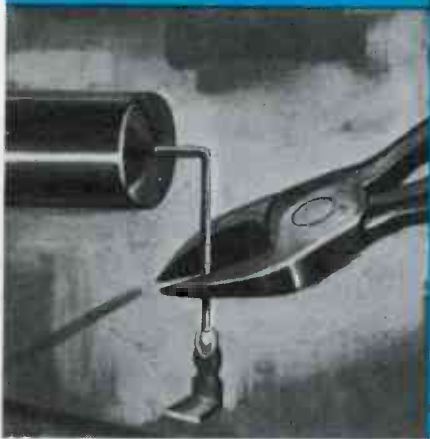
The 3-in-1 KWIKETTE is not just another wire spring connector . . . Copperweld wire inner core, an intermediate layer of flux, and an outer jacket of solder . . . **ALL YOU NEED IS HEAT!**



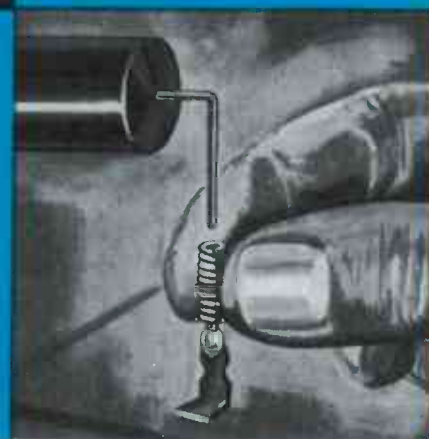
Nine times
actual size

Once again, Sprague helps the TV-radio service industry by solving difficult servicing problems . . . parts replacement on printed wiring boards, in "inaccessible" chassis nooks, and on crowded terminal lugs. Mechanically sturdy and electrically reliable, the KWIKETTE provides *quick*, expert, "one-handed" soldered connections as easy as A-B-C!

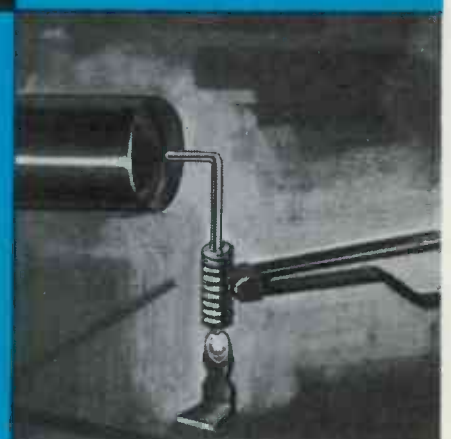
A SNIP LEAD...
it's quick!



B SLIP ON KWIKETTE...
it's quick!



C APPLY HEAT...
it's quick!



**NOBODY ELSE HAS KWIKETTE CONNECTORS . . .
YOU GET 'EM ONLY FROM SPRAGUE PRODUCTS!**

KWIKETTES are now being packed with Sprague Atom® Capacitors at no extra cost to you! Whenever you need tubular electrolytics, insist on pre-packaged Sprague Atoms from your parts distributor and you'll automatically get your KWIKETTE component connectors . . . the biggest boon to the service technician since the soldering gun!

*Trademark

WORLD'S LARGEST MANUFACTURER OF CAPACITORS

Circle 3 on literature card

www.americanradiohistory.com



January, 1966/PF REPORTER 49



1,863 reasons why Sprague Twist-Lok® Capacitors help you to protect your reputation

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

With 1,863 different Sprague Twist-Lok Capacitors as standard catalog items, and more being added regularly, Sprague gives you the world's most complete selection of exact replacements.

We don't have to tell you that it's easier to service with exact replacements. And we don't have to tell you that it's better, too. When sets are designed, specific capacitance values are used for peak operation, so it takes exact replacements to restore original set performance.

And who better than Sprague knows which values and sizes are needed in the replacement market? Sprague, the world's largest component manufacturer, has the most complete specification file on original set requirements. That's why you're always right when you work with Sprague Twist-Lok exact replacements!

GET YOUR COPY of Sprague's comprehensive Electrolytic Capacitor Replacement Manual K-107 from your Sprague Distributor.



HAVE YOU TRIED KWIKETTE™ CONNECTORS?

Not just another wire spring connector! Copperweld wire inner core, a layer of flux, and an outer coating of solder . . . all you supply is heat! Now being packed with Sprague Atom® Capacitors at no extra cost to you! See your distributor!

★TRADEMARK



WORLD'S LARGEST MANUFACTURER OF CAPACITORS

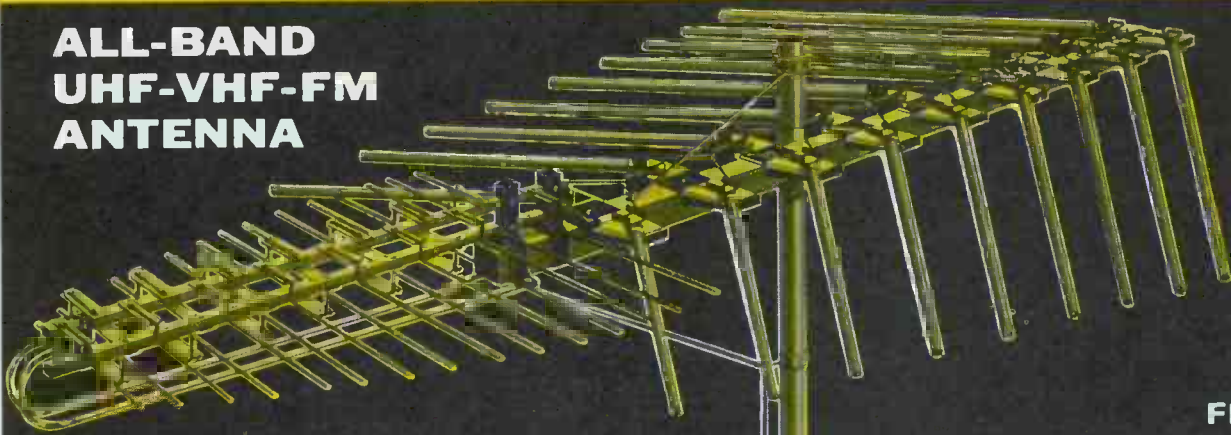
Sprague Products Co., 509 Marshall St., North Adams, Mass. 01248

FINCO

COLOR-VE-LOG ANTENNAS

FOR UHF, VHF, FM RECEPTION

ALL-BAND UHF-VHF-FM ANTENNA

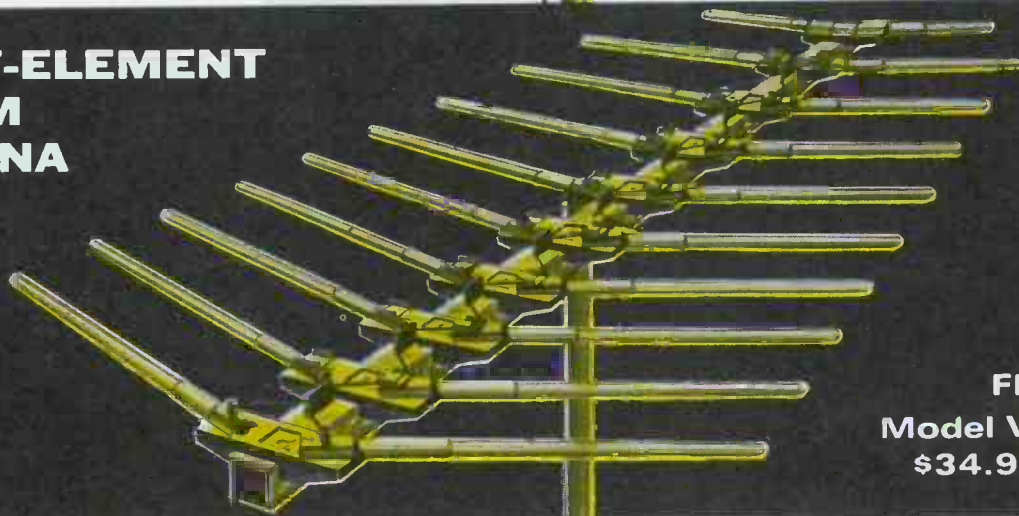


FINCO
Model UVF-24
\$59.95 list

The one antenna that does the work of 3! Gives startlingly clear black and white pictures and beautiful color on both UHF and VHF television channels — plus the finest in stereophonic and monophonic sound reproduction.

FINCO Model UVF-18 — \$42.50 list
FINCO Model UVF-16 — \$30.50 list
FINCO Model UVF-10 — \$18.50 list

SWEPT-ELEMENT VHF-FM ANTENNA



FINCO
Model VL-10
\$34.95 list

FINCO's Color-Ve-Log challenges all competition! Its swept-element design assures the finest in brilliant color and sharply defined black and white television reception — as well as superb FM monaural and stereo quality.

FINCO Model VL-18 — \$54.50 list
FINCO Model VL-15 — \$46.95 list
FINCO Model VL-7 — \$23.95 list
FINCO Model VL-5 — \$16.95 list

Featuring FINCO's exclusive Gold Corodizing

FINCO COLOR-VE-LOG

Prices and specifications subject to change without notice

THE FINNEY COMPANY • 34 W. Interstate Street • Bedford, Ohio

Write for beautiful color brochures Number 20-322, and 20-307, Dept. 310

Circle 5 on literature card

BE SURE

AEROVOX

AFHS 4-88-10

▲ 80 MFD 450V

■ 30 450

▲ 20 450

PLN 40 150

CAN NEG 610366

**REACH FOR AEROVOX
COLOR CERTIFIED
ELECTROLYTICS**

Your color TV customer wants nothing less than the best... and now Aerovox announces *COLOR CERTIFIED* Electrolytics for every color TV set now being produced.

Don't take chances on mis-match... check the original manufacturer's part number in the convenient Aerovox Color TV Cross Reference and get the Exact Aerovox Electrolytic replacement you need.

Your Authorized Aerovox Distributor has them in stock right now in distinctively packaged, factory-fresh cartons. Ask him to *reach for Aerovox COLOR CERTIFIED* Electrolytics—the units with etched cathodes built to withstand heavy ripple.

Don't forget—**COLOR CERTIFIED** Electrolytics to be sure....
you pay no more.



AEROVOX CORPORATION
DISTRIBUTOR DIVISION NEW BEDFORD, MASS.

Technical Leadership - Manufacturing Excellence
Circle 6 on literature card

Letters to the Editor

Dear Editor:

Can you please publish a complete list of radio and television manufacturers plus a list of test-equipment manufacturers for the last several years?

As you should well know, we technicians often need to write for information. I imagine you get plenty of letters like this. If you could publish these two lists, you might help yourselves as much as us, for then we could write directly to the manufacturer.

CHARLES MONTAG

Henderson, Texas

The addresses of radio and television manufacturers can be found in the PHOTOFACT Annual Index available at your electronic parts distributor. In addition, we published "Source Guide to Imported Sets" in the June 1965 issue of PF REPORTER. The list of test-equipment manufacturers seems fine. We just might consider this for a future issue.—Ed.

Dear Editor:

I don't agree with the schematic in Fig. 1 on page 36 of your September 1965 issue. I was always taught that the collector-emitter junction of a PNP transistor should be reverse-biased; that is, the collector is more negative than the emitter. You have shown a positive voltage to the collector in Fig. 1B. If positive voltage was to be used, it should have been connected to the emitter. Possibly this should be an NPN transistor.

In Fig. 1A, the transistor will be cut off without a signal. This is an NPN transistor and will need a positive-going signal to make it conduct at all. Any negative signal will only tend to cut it off further with no output on the negative half-cycle.

I may very well be wrong, but this is the way I understand transistors. If I have learned wrong, I want to get it straightened out as soon as possible. I enjoy reading, or I should say studying, your magazine each month. I am a technician in the U.S.A.F., and I do radio and TV servicing in my spare time. I have really found some helpful articles in PF REPORTER.

CARL COLLINS

Tampa, Florida

Your understanding of the action of the circuit in Fig. 1B is correct. I just can't understand how these errors creep into our magazine. Our artist has the emitter arrow pointing in the wrong direction. Sorry!

The time constant of the input resistor and capacitor in Fig. 1A can determine whether or not the transistor has an output during the negative input half-cycle. If the time constant is long enough, base current during the positive half-cycle can produce enough charge in the capacitor to bias the transistor into conduction during the negative half-cycle. The output may or may not be linear, but there can be an output during the negative half-cycle.—Ed. ▲



The Electronic Scanner

news of the servicing industry

Consumer-Electronics Sales Boom in 1965

Sizeable increases in distributor sales of color and black-and-white television sets and portable and table-model phonographs during the first three quarters of 1965 over comparable figures for 1964 were reported by the Electronic Industries Association's Marketing Services Department. Increases in distributor sales were also noted for home radios, including FM, and automobile radios during the first eight months of 1965 as compared to the same 1964 period.

Cumulative nine-month distributor sales of all television sets in 1965 totaled 7,412,808 units, an increase of 19.42% over the 6,207,147 sold from January-September 1964. Of total TV distributor sales, monochrome sales accounted for 5,628,856 units during the nine-month period, a 4.19% increase from 5,402,301 sets in the comparable 1964 period. Color TV set distributor sales totalled 1,783,952 in the 1965 nine-month period, a 121.65% increase over the 804,846 units sold in the same part of 1964.

Of total home-radio sales, FM-radio distributor sales for January-August 1965 totaled 1,557,562, up 69% from the 921,414 figure for the same period of 1964. Figures include table, clock, and portable radios.

Auto-radio sales by distributors in the eight-month period of 1965 totaled 6,511,333, up 24.3% from a figure of 5,236,598 units in the same eight-month period of 1964.

Distributor sales of phonographs in the first three quarters of 1965 totaled 3,446,604 units, an increase of 17.4% over the 2,936,690 total for the January-September period of 1964. Of the phonograph sales, portable, and table models accounted for 2,377,678 units, an increase of 30.1% over the 1,827,651 in the comparable nine-month period of 1964. Console distributor sales were down 2.83% over the nine-month period, from 1,109,034 in the 1964 period to 1,068,926 units in the three quarters of 1965.

TV Sales by Distributors						
	Monochrome		Color		Total TV	
	'65	'64	'65	'64	'65	'64
December	811,446		226,478		1,037,924	
November	711,243		163,754		874,997	
October	789,970		171,223		931,193	
September	935,475*	839,863	463,872*	157,603	1,399,347*	997,466
August	647,539	562,182	258,431	98,034	905,970	658,216
July	658,907	537,183	223,110	83,795	882,017	650,978
June	533,123	613,124	172,226	93,902	705,349	707,026
May	425,082	396,528	73,878	42,255	498,968	438,783
April	524,418	513,058	111,340	57,401	635,758	570,459
March	662,755	687,748	166,943	83,073	829,698	770,819
February	608,538	644,062	168,460	97,091	777,998	741,153
January	632,009	588,555	145,694	83,692	777,703	672,247

*Preliminary

Radio Sales by Distributors						
	Home**		FM***		Auto	
	'65	'64	'65	'64	'65	'64
December		1,482,883		323,779		900,098
November		1,148,658		227,063		646,755
October		1,158,890		221,875		844,805
September	1,485,591*	1,297,571		240,378	867,719*	962,162
August	1,031,745	869,500	223,646	132,613	755,764	713,857
July	1,160,053	794,328	246,220	141,362	720,599	370,087
June	1,020,575	868,247	236,772	140,422	848,097	742,551
May	705,901	571,989	120,983	92,103	800,121	688,761
April	745,221	600,301	148,640	101,882	797,112	637,888
March	1,006,047	769,425	241,043	115,886	1,010,225	770,879
February	892,017	664,671	197,905	108,047	798,834	613,238
January	693,005	544,815	145,353	89,399	780,581	699,317

*Preliminary
**Includes table, clock and portable
***Included in home radios and excluding auto FM

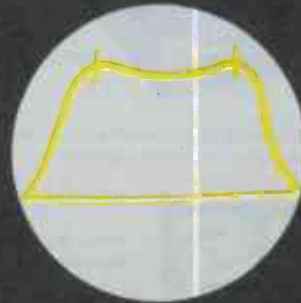
Phonograph Sales by Distributors						
	Portable/Table		Console		Total	
	'65	'64	'65	'64	'65	'64
December		684,234		251,339		935,573
November		420,383		190,555		610,938
October		483,348		187,742		673,088
September	510,781*	393,326	179,930*	214,947	690,711*	608,273
August	352,940	260,702	149,353	134,051	502,293	394,753
July	262,984	184,613	128,655	101,706	391,639	286,319
June	214,292	217,171	111,371	126,026	325,663	343,197
May	138,662	136,669	51,152	70,682	189,814	207,351
April	194,959	132,858	81,916	89,331	276,875	215,289
March	239,209	179,204	136,264	144,880	375,473	324,084
February	272,533	164,220	112,979	116,920	385,512	281,140
January	191,318	158,888	117,308	113,396	308,624	272,284

COMPLETE TUNER OVERHAUL



ALL MAKES —
ONE PRICE

995



3.58

COLOR TUNERS

ALL LABOR AND PARTS
(EXCEPT TUBES & TRANSISTORS)*

GUARANTEED COLOR ALIGNMENT — NO ADDITIONAL CHARGE



VHF



UHF



COLOR



U-V



TRANSISTOR

Simply send us the defective tuner complete; include tubes, shield cover and any damaged parts with model number and complaint. Your tuner will be expertly overhauled and returned promptly, performance restored, aligned to original standards and warranted for 90 days.

UV combination tuner must be single chassis type; dismantle tandem UHF and VHF tuners and send in the defective unit only.

Exact Replacements are available for tuners unfit for overhaul. As low as \$12.95 exchange. (Replacements are new or rebuilt.)

And remember—for over a decade Castle has been the leader in this specialized field . . . your assurance of the best in TV tuner overhauling.

Pioneers of TV



Tuner Overhauling

CASTLE

TV TUNER SERVICE, INC.

MAIN PLANT: 5701 N. Western Ave., Chicago 45, Illinois

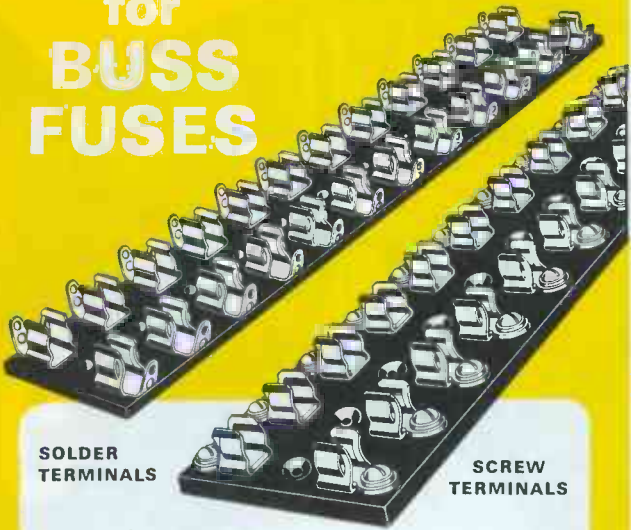
EAST: 41-90 Vernon Blvd., Long Island City 1, N.Y.

CANADA: 136 Main Street, Toronto 13, Ontario

*Major Parts are additional in Canada

Circle 7 on literature card

BLOCKS for BUSS FUSES



SOLDER
TERMINALS

SCREW
TERMINALS

Above standard types available in any number of poles—
From 1 to 12... plus other types for every application....

BUSS

Write for BUSS
Bulletin SFB

BUSSMANN MFG. DIV., McGraw-Edison Co., ST. LOUIS, MO. 63107

facturer to dispense with the bulky convergence yoke and to incorporate the remaining convergence control in the deflection yoke. Also, high-voltage requirement for this 11" tube is reduced to 15 kv.

Pilot production of a 21" rectangular color-TV picture tube (see photo below) has started at Motorola's new tube factory at Franklin Park, Ill. Plans call for the start of volume produc-



tion by March. Estimations are that the new plant will produce at least 100,000 21" units in 1966.

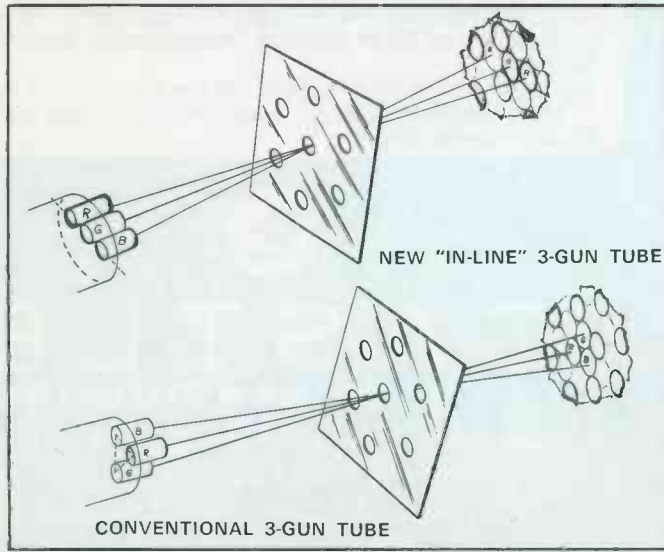
A 90°, rectangular 22" rare-earth color-TV picture tube

BUSS: The Complete Line of Fuses and

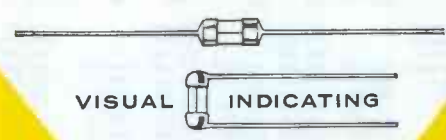
Picture-Tube News

A plant to manufacture glass television bulbs for the Mexican market will be built at Monterrey, Mexico, by **Productos Corning de Mexico**, a subsidiary of **Corning Glass Works**. Construction will begin immediately on a 66-acre site five miles northeast of Monterrey. The 53,000-square-foot plant is expected to be in operation by June 1966.

The 11" tube produced by **General Electric** for their new portable uses the same principles as the standard aperture-mask color tube, but it incorporates a different electron-gun arrangement. The three electron guns that produce the primary colors—red, green, and blue—are positioned in a straight line, instead of the delta or triangular arrangement used in the conventional tube. This switch to "in-line" arrangement is said to reduce convergence problems, which allows the manu-



TRON SUB-MINIATURE PIGTAIL FUSES



BODY SIZE
ONLY
.145 x .300
INCHES

For use on miniaturized devices, or on gigantic space tight multi-circuit electronic devices.

Glass tube construction permits visual inspection of element.

Smallest fuses available with wide ampere range. Twenty-three ampere sizes from 1/100 thru 15 amps.

Hermetically sealed for potting without danger of sealing material affecting operation. Extremely high resistance to shock or vibration. Operate without exterior venting.

Insist On
BUSS
QUALITY
Fuses

Write for
BUSS
Bulletin SFB

BUSSMANN MFG. DIVISION, McGraw-Edison Co., St. Louis, Mo. 63107
Circle 8 on literature card

BUSS QUALITY

small
dimension
fuses



For protection of all types of electronic and electric devices

The complete line of BUSS and "TRON Family" fuses includes quick-acting, slow-blowing, signal or visual indicating fuses in sizes from 1/500 amperes up.

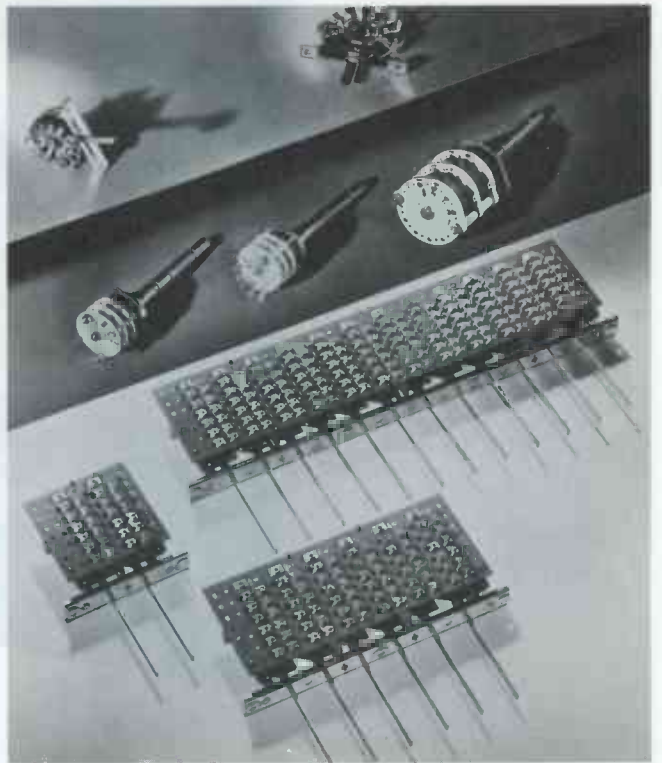
All standard items are easily obtained through your BUSS distributor, but if you don't find what you want get in touch with us.

Insist On
BUSS
QUALITY
Fuses

Write for
BUSS
Bulletin SFB

BUSSMANN MFG. DIVISION, McGraw-Edison Co., St. Louis, Mo. 63107

switches through local supply houses. The entire line was pre-selected to give distributors switch types preferred by OEM customers. Many designs now available were formerly produced on a custom-made basis. Increased usage of computers, peripheral electronic data-processing equipment, office equipment, audio equipment, meters, speakers, and similar equipment has increased demand for these switch types.



.. Fuseholders of Unquestioned High Quality

will be introduced next spring by Sylvania. In order to facilitate design of TV chassis and cabinets, samples will be sent to the nation's leading color-TV manufacturers. At present, Sylvania's tube plant in Seneca Falls, N. Y. is operating on a round-the-clock schedule to help meet demands. In March, a new plant in Ottawa, Ohio will begin production of color tubes, augmenting production at Seneca Falls. In the fourth quarter of 1966, manufacturing capacity will approach two million color-TV picture tubes annually.

Seminars and Services

Overhauling and rebuilding for all makes and models of TV tuners is available from **Castle Television Services, Ltd.** in Toronto, Ontario. Color tuners are processed at no additional charge. The Canadian company is under the personal direction of Mr. A. Ernie Hanson.

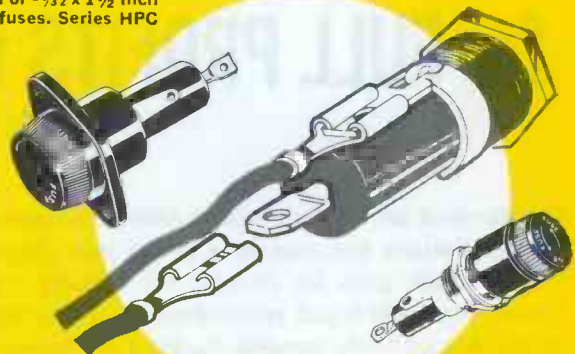
More than 300 radio-TV service dealers recently attended a test-equipment seminar at Holiday House in Monroeville, Pa. Sponsors were **Lectrotech, Inc.** and Lectrotech distributors, M. Leff Radio Parts Co., Braddock, Pa., and Huston Electronics, Inc., Tarentum, Pa. Seminar subject was "The Problems of Servicing Color TV." Demonstrations on how to check color-TV picture tubes and use a vectorscope were given by William Grossman, Lectrotech president.

A factory-authorized tuner-repair center to serve the Eastern states has been opened by the **Tuner Service Division of Sarkes Tarzian, Inc.** The new center, **Tuner Service Corporation** is located at Jersey City, N.J. The new center will offer complete overhaul service on a 24-hour basis.

New Switch Line

A broadened line of switches for immediate delivery from electronic-parts distributors, "Operation Quick Switch" is being offered by **Oak Manufacturing Co.**, Crystal Lake, Ill. The firm provides a complete line of rotary, pushbutton, lever, and slide

For $1\frac{1}{2} \times 1\frac{1}{2}$ Inch
fuses. Series HPC



For $\frac{1}{4} \times 1\frac{1}{4}$ inch fuses
Series HJ, HK and HLD

SAVE ASSEMBLY TIME with
QUICK CONNECT
TERMINALS ON
BUSS FUSEHOLDERS

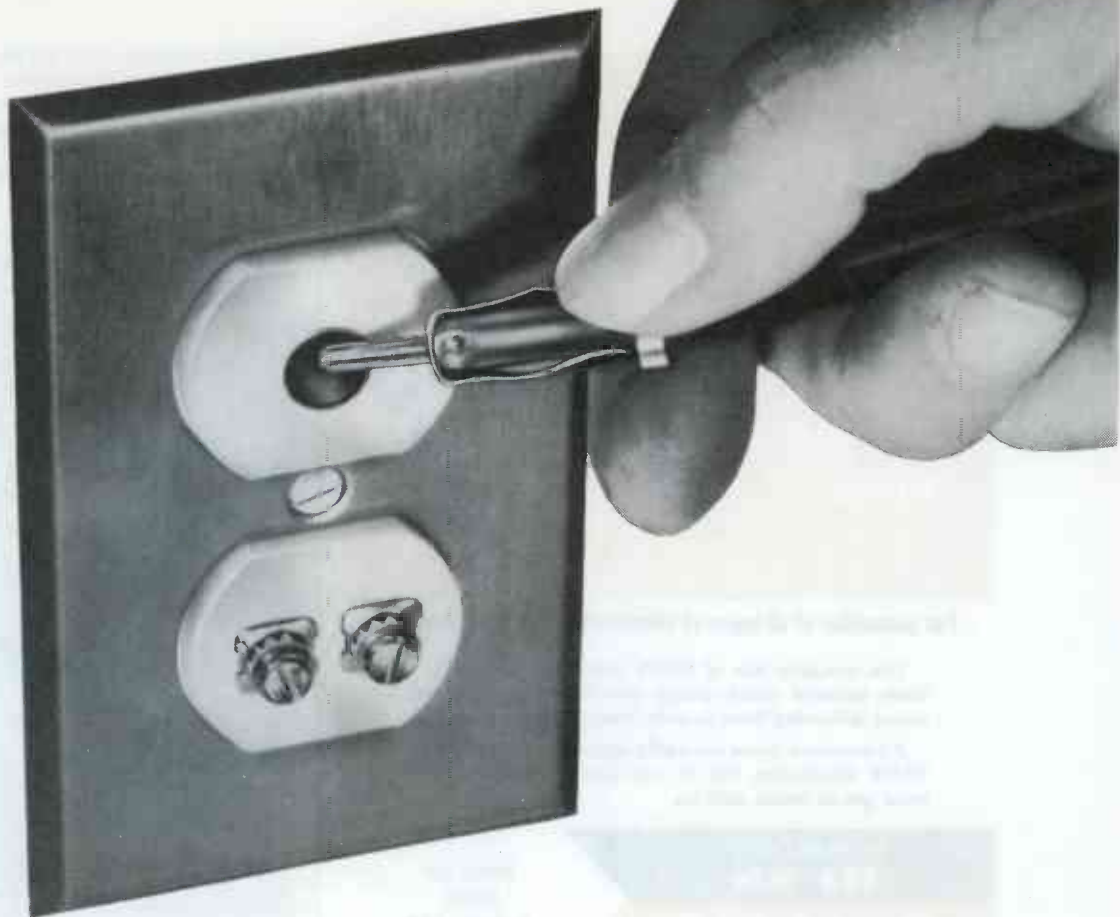
Eliminates soldering. Permits use of
pre-assembled harness. Reduces assembly time.

Insist On
BUSS
QUALITY
Fuseholders

Write for
BUSS
Bulletin SFB

BUSSMANN MFG. DIVISION, McGraw-Edison Co., St. Louis, Mo. 63107

Circle 8 on literature card



The most important connection you can make for FULL PROFITS from FULL-HOUSE TV!

The demand for multiple outlet, Master Antenna TV installations has entered a totally new phase ...one which goes far beyond the already big market for commercial applications and reaches to millions of newly created multiple set homes.

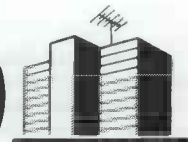
Color TV...as well as increasing FM multiplex popularity is the big reason why. Every homeowner who buys a color set instantly becomes a prospect for a residential MATV installation to operate two, three, or more receivers with maximum quality reception from one antenna.

New Channel Master mass production tech-

niques on the same precision-quality, commercial-grade MATV components designed for big building applications have resulted in equipment price reductions that average 25% and more per installation. For MATV installing companies this means more volume and profit from highly competitive commercial jobs. For radio-TV service dealers it means an opportunity to get started in a totally new, high-income business meeting the booming demand for residential master antenna systems. The market is here now. And, it represents business that only you...a qualified service technician...can get.

IMPORTANT... Contact your Channel Master distributor now for details on a complete MATV system design and installation course.

CHANNEL MASTER
ELLENVILLE, N.Y.





This is Al's new service van.

(Even for color it's all he needs with Amphenol's portable test equipment.)



Amphenol's new color television test equipment is so compact, there's room to spare, even in the smallest service truck. Try this for size—the Amphenol Color Commander (color bar generator) with nine useful patterns, yet no bigger than a small lunch box. Or our new CRT checker-rejuvenator with a built-in high impedance voltmeter in a 9" x 12" x 5" case.

There's even a versatile TV-FM field strength meter in a "pint" size package. And the cost of this equipment is as small as its size.

But don't let the compactness of Amphenol's test equipment fool you. Precision is as good as equipment many times the price. For example, the Signal Commander, either plug-in frequency module is under \$190, and yet is the only field strength meter in its price class to provide absolute signal readings.

Look over the complete Amphenol Commander line at your Amphenol distributor. Or write us for descriptive literature.



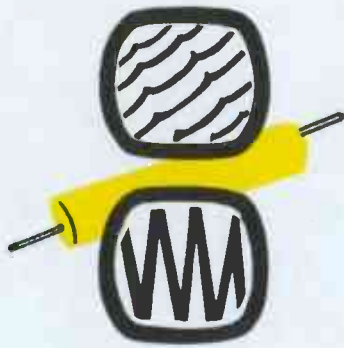
AMPHENOL DISTRIBUTOR DIVISION

AMPHENOL CORPORATION

2875 South 25th Avenue, Broadview, Illinois 60155

Circle 10 on literature card

January, 1966/PF REPORTER 27



ONE COMPONENT... MANY SYMPTOMS

Multiple troubles are sometimes caused
by a single resistor or capacitor.

by Mickey Roberts

It was 6:30 on a hot summer Saturday afternoon. Business had been slow all week, so I decided to lock up for the weekend. Just as I was walking out the door, the phone rang. That's luck, no business all week, but try to close up and the phone rings! When I lifted the receiver, Mrs. Jones was on the other end of the line asking me if I would come over and look at her TV set. I was about to say, "I'm closed," but before I got the words out of my mouth, she interrupted. "It's only one of those little tubes in the back, and my husband will be so disappointed if he can't watch the ball game tonight."

The Joneses had been customers in the past and lived only a few blocks from the shop; so I decided—against my better judgement—I had better take the job.

I asked, "What seems to be the trouble, Mrs. Jones?"

She replied, "The sound is weak and has a buzz in it, and the picture is not black enough, you know, kind of all white."

"Okay," I said without much enthusiasm, "I'll be right over."

She was waiting at the door when I arrived. Smilingly she said, "We bought this set only a few months ago, so I'm sure it's only a tube and will not take much of your time."

I turned the set on and examined the picture while listening to the sound (or trying to above Mr. Jones's complaining something about they should have kept the old set; "this one is already causing trouble"). There was little contrast, the sound was weak with an annoying buzz, vertical retrace lines were

visible, and the picture was bending at the top. I changed channels, and when I did, the set lost horizontal sync. With the hold control, I restored sync, but the picture was bending again; turning the contrast control did little for the picture. Thinking, "This is probably a tube in the video-IF or video-output section," I rotated the brightness control from habit more than anything else. I've found that many times rotating the controls will give valuable clues to the defective section. However, in this case it only served to confuse me. The brightness control had little effect and would not extinguish the raster.

As I was removing the back from the set, I was trying to decide what tube, if any, could be causing so many troubles. I discounted the video-IF tubes because it is unlikely that they would affect the brightness circuit. This meant the only tubes that could cause these symptoms were the video-output or picture tube. However, by this time I had about given up hope of tubes being the source of trouble. With the confidence of a baby taking its first step, I substituted the video amplifier and output tubes.

When I turned the set on again, the sound was okay until the sweep circuits warmed up; then the original trouble occurred again.

Having learned long ago (after taking a few sets to the shop because of tubes) always to check any tubes that could be even remotely responsible for the trouble, I proceeded to check all the tubes including the CRT. Little to my surprise, the tube tester showed they

were all good.

I explained that the set would have to be taken to the shop for repair. This statement always seems to get the same general line of questioning—this was no exception.

Mr. Jones stared disgustedly and grumbled, "What do you think is the trouble? How much will it cost? Can you fix it tonight?"

Rather than admit I hadn't the slightest idea of what was wrong, I answered with my Sunday technical talk and made the estimate plenty high without committing myself to a return date.

He frowned and said, "The thing is no good like that. You may as well go ahead and take it."

Loading up the set—cabinet and all—drew such remarks as, "You be very careful and don't scratch that cabinet; we paid quite a bit extra to get the nicer cabinet."

At the shop, pulling the chassis and connecting it to a test picture tube proved only that my tube tester had not lied about the picture tube being good. As I stared at the hundreds of dollars worth of test instruments before me, I wasn't sure which one to choose. In fact, I wasn't even convinced that the "big brass" in the test equipment industry had the unit I needed on the drawing boards. Knowing that a large percentage of troubles can be found with a VTVM, I reached for the leads.

Discounting the fact that the raster could not be extinguished, I thought it possible that the other troubles could all be caused by the video amplifier or output circuit,

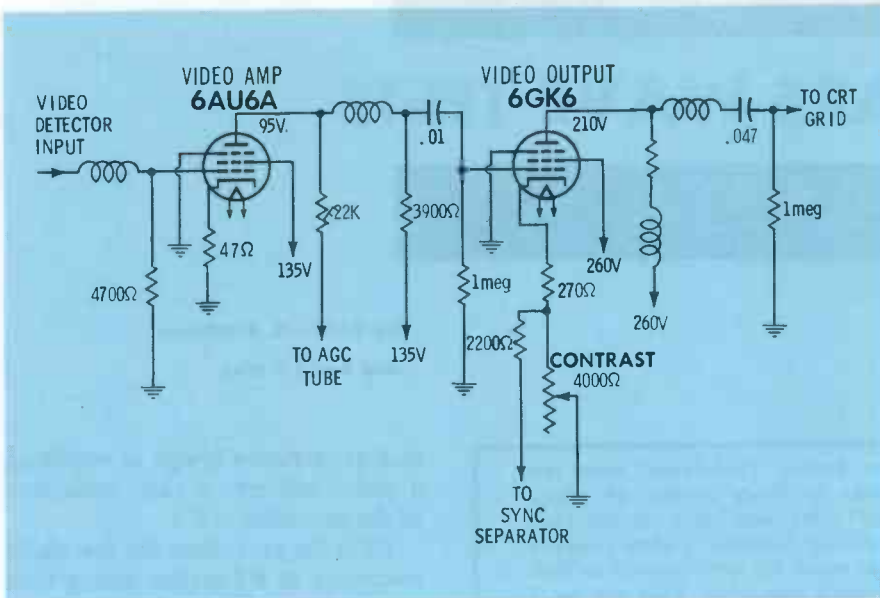


Fig. 1. Decreased voltage on video-amplifier tube caused a number of symptoms.

shown in Fig. 1. The voltages on all elements of the video-output tube were well within tolerance, so I proceeded to the video-amplifier stage. Suddenly I realized my luck must be changing, because the plate measured only 60 volts and the screen, which is connected directly to the 135 volt source, read 80 volts. Finding this caused me to smile for the first time since this chassis and I had become acquainted.

Directing my attention to the power supply (Fig. 2) proved to be the wisest step I had taken yet. The transformer side of dropping resistor R1 showed a normal 145 volts. This meant the resistor must have increased in value. A look at the schematic revealed the 135-volt line was also supplying, along with the video-output circuits, the video-IF tubes, the sound-IF and detector stages, and the cathode of the 6HS8 sync separator/AGC keyer/noise inverter tube. This explained the multiple trouble—or did it? I suddenly remembered the brightness-control problem. I turned the set on and waited to see what happened.

The set came on with a normal picture and good sound. I rotated the brightness control; much to my amazement, it operated as it should. When I looked closely at the circuit shown in Fig. 3, I realized why I had been unable to extinguish the raster with the brightness control. The reduced 135-volt source voltage had been insufficient to develop the cathode-to-grid bias required to cut off the CRT.

Replacing the chassis in the cab-

inet and returning it to the owner with a bill considerably less than the estimate made both the customer and me happy.

Some Customers Are Impossible

A few days later, a customer came into the shop carrying a television set with him. He walked over to the bench and set the receiver on it. Turning to me he said, "Do you think you can repair that set?"

I replied, "That's what I'm here for, and I haven't failed on one yet."

His next comments were, "I hope you aren't as unreasonable on price as the last guy was. He came out to the house, put in one tube, and was gone in ten minutes, but charged me \$9.40. Can you imagine a \$5.00 labor charge for only ten minutes work? That's \$30.00 an hour! Well, this time when the set quit working I took all the tubes to a drug store

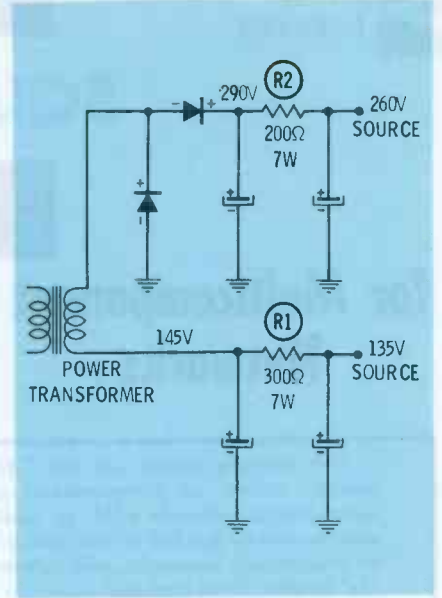


Fig. 2. R1 increase caused the trouble.

and checked them. I found four bad ones and got them all four for less than that guy charged me. There must be something else burned out, though because it still has a faint picture and no sound at all. So what do you think is wrong, and can you fix it while I wait?"

I probably could have repaired the set while he waited, but I knew if I did and charged a reasonable price, he would spread the word that I, too, charged outrageous prices. I answered, "I can't be sure what the trouble is until I make some circuit checks, but I won't be able to get around to that until tomorrow." From experience, I knew that when a customer checks all the tubes, he is likely to put one back in the wrong socket. I checked this out thoroughly and convinced myself that at least he had the tubes where they belonged. I fired up the

• Please turn to page 78

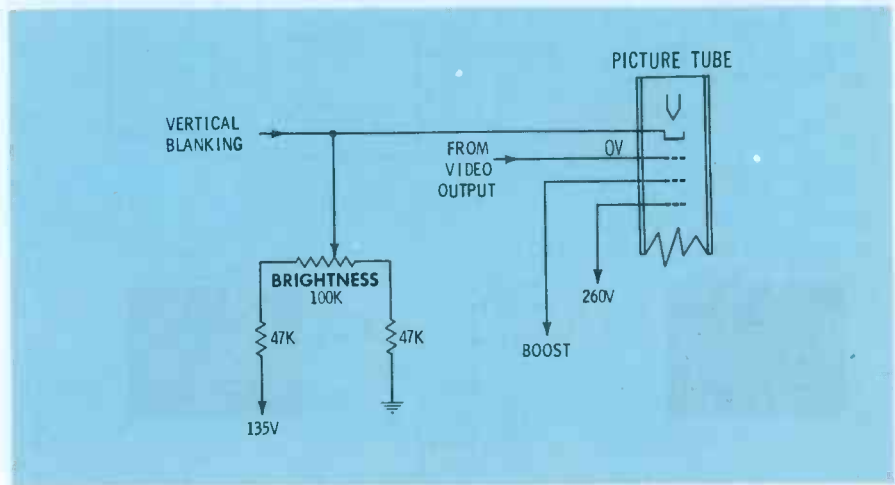


Fig. 3. Reduced supply voltage affected operation of the brightness control.

SQUARE-WAVE TESTS

for Multicomponent Networks

by Robert G. Middleton
and David I. King

This month's section of our "Advance Service Techniques" links last month's review on three-terminal networks to future articles on active (amplifying) networks such as audio and video amplifiers. Square-wave analysis can be applied to both active and passive networks to show presence of capacitance, resistance, and inductance in much the same manner as with the simpler three-terminal networks previously described. Tests for more complex circuits won't always be as simple as, for example, the $R_1 C_1 = R_2 C_2$ test; yet basic principles will remain the same.

Square-wave tests have been used for quite some time not only for design-laboratory experiments, but also for routine maintenance in industrial electronics and data processing; also, many production-line quality-control tests are based upon square-wave analysis. An excellent example is the importance manufacturers give to rise-time and overshoot characteristics when they describe many of their products.

As in the past, many production techniques previously used only in military and industrial electronics are now coming into use in home-entertainment devices—microcircuits are one example. To service home-entertainment devices effectively using these innovations, the service technician must be ready to adopt and adapt techniques used in military and industrial electronics.

A wideband triggered-sweep scope, such as those described in "Learning About Triggered-Sweep Scopes" has been used throughout this series. If you can arrange to use a scope such as this, try to do so; possibly a local TV station will let you become familiar with one of theirs. Even if you can't get to one of these scopes, follow with us. Information given in this series will be invaluable in the future.

—The Editor

A multicomponent coupling network such as the one in Fig. 1A may well appear formidable; fortunately most of its components can be tested

with an ohmmeter or capacitance bridge. For example, an ohmmeter can be used to check R_1 at terminals 1 and 2, and R_3 at terminals 5 and

6; a capacitance bridge at terminals 4 and 6 will give a valid indication of the condition of C_3 .

C_2 is the exception; the low shunt resistance of R_2 makes testing with a capacitance bridge difficult if not impossible. You can however add a .1-mfd capacitor, C_1 , across terminals 1 and 2, as Fig. 1A shows. The resulting network is shown in Fig. 1B. If a square wave is applied at terminal 1 ($W1A$), a square wave ($W-B$) with identical waveshape, including equal rise time, should appear at terminal 2—p-p amplitude will be half that at terminal 1.

For best results, select a square-wave frequency that has a half-period interval close or equal to the $R_1 C_1$ or $R_2 C_2$ time constant. Here, time constant in sec is the product of R in megs and C in mfd: $.01 \times .1 = .001$ or 1 msec. The RC circuit is allowed to charge for each half of the square-wave period. Since period is the reciprocal of frequency, if the applied square wave frequency in Fig. 1 is 500 cps, then half-period interval = $\frac{1}{2} \times \frac{1}{500} = .001$ or 1 msec. For a proper comparison of waveshape and rise time between $W1A$ and $W1B$, first select a scope sweep speed that shows a full square-wave period. Then compare leading edges and waveform tops; their shapes should be identical. Next, increase scope sweep speed or (if your scope has the provision) expand the trace until the time interval between 10% and 90% of maximum amplitude can be measured; rise times should be identical.

If the C_2 value is decreased, rise time will remain equal to that at the input but the waveform top will begin to tilt downward immediately after the leading edge, indicating differentiation—the p-p amplitude will exceed half that at the input.

The $R_1 C_1 = R_2 C_2$ test for three-

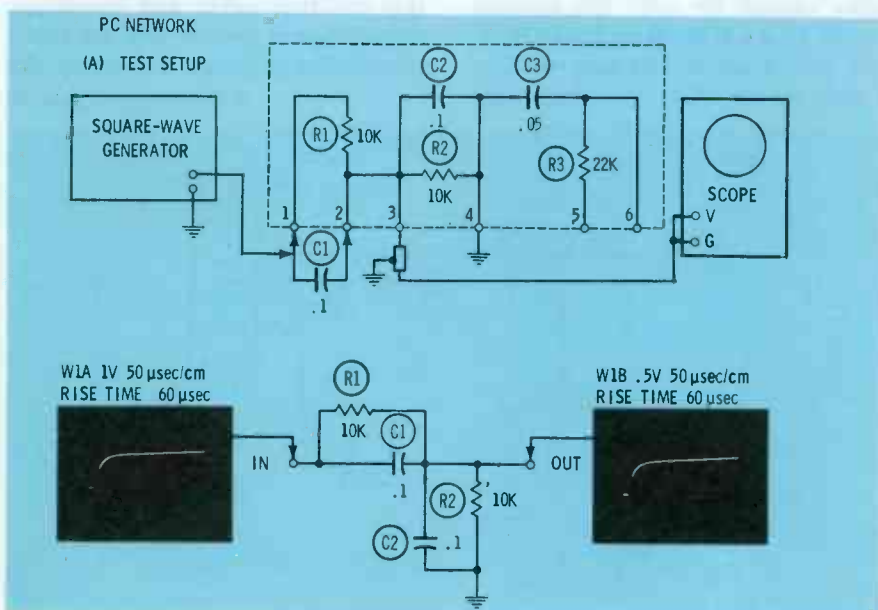


Fig. 1. Addition of C_1 allows simple test; input and output waveshapes are identical.

terminal networks, as shown in Fig. 1, was detailed in the previous article of this "Advanced Service Techniques" series; this test is useful for single-section integrating networks. Tests for multisection integrators, however, are not as simple.

Multisection Integrator Theory

A graphical description of multisection integrator action is given in Fig. 2. A wideband triggered-sweep scope was used to obtain all waveform photos. To show properly all phase relationships, the horizontal sweep was triggered with the leading edge of the positive-going square-wave-generator output. The time constant of each integrator section is $.01 \text{ meg} \times .1 \text{ mfd} = .001 \text{ sec}$, or 1 msec.

At W1, the applied square-wave frequency is 50 cps; the applied square-wave half-period interval is $\frac{1}{2} \times 1/50 = .010 \text{ sec}$, or 10 msec. This is ten times the time constant of each integrator section. W1A, W1B,

and W1C give the appearance of resulting from successive integrations.

With the applied frequency increased to 500 cps (square-wave half-period interval equals integrator-section time constant), waveform photos show that the first, second, and third integrator sections produce different waveshapes. W2A is a typical sawtooth, but the shape of W2B seems midway between the sawtooth shape of W2A and the parabolic shape of W2C. Note the resemblance of waveshape W2C to a sine wave. In contrast to the output levels with a 50-cps square wave applied, a marked decrease in p-p output level from the two- and three-section integrators is observed with the application of a 500-cps square wave. An input-frequency increase to 5 kc produces: (1) a sawtooth waveshape with an amplitude 5% of input at the one-section integrator output. (2) a parabolic waveshape with an amplitude .2% of input at the two-section integrator output,

and (3) a DC level at the three-section integrator output.

An explanation of the p-p amplitude isn't difficult: As input frequency increases, capacitive reactance decreases, and a greater part of the input signal is dropped across the resistors. Still, this does not explain the cause of the altered waveshapes at the two- and three-section integrator outputs.

Successive Integration

Note the leading edges of W2B, W2C, and W3B. The scope is synced on the leading edge of the applied square wave, yet the rising leading edges start almost midway in the first half-period interval. Successive integration shifts the relative phase of the output signal. Examination of the superimposed waveform photo in Fig. 3 shows the cause for both the phase shift and waveshape change.

After several input intervals, the integrator capacitor charges to the average DC level, which for a

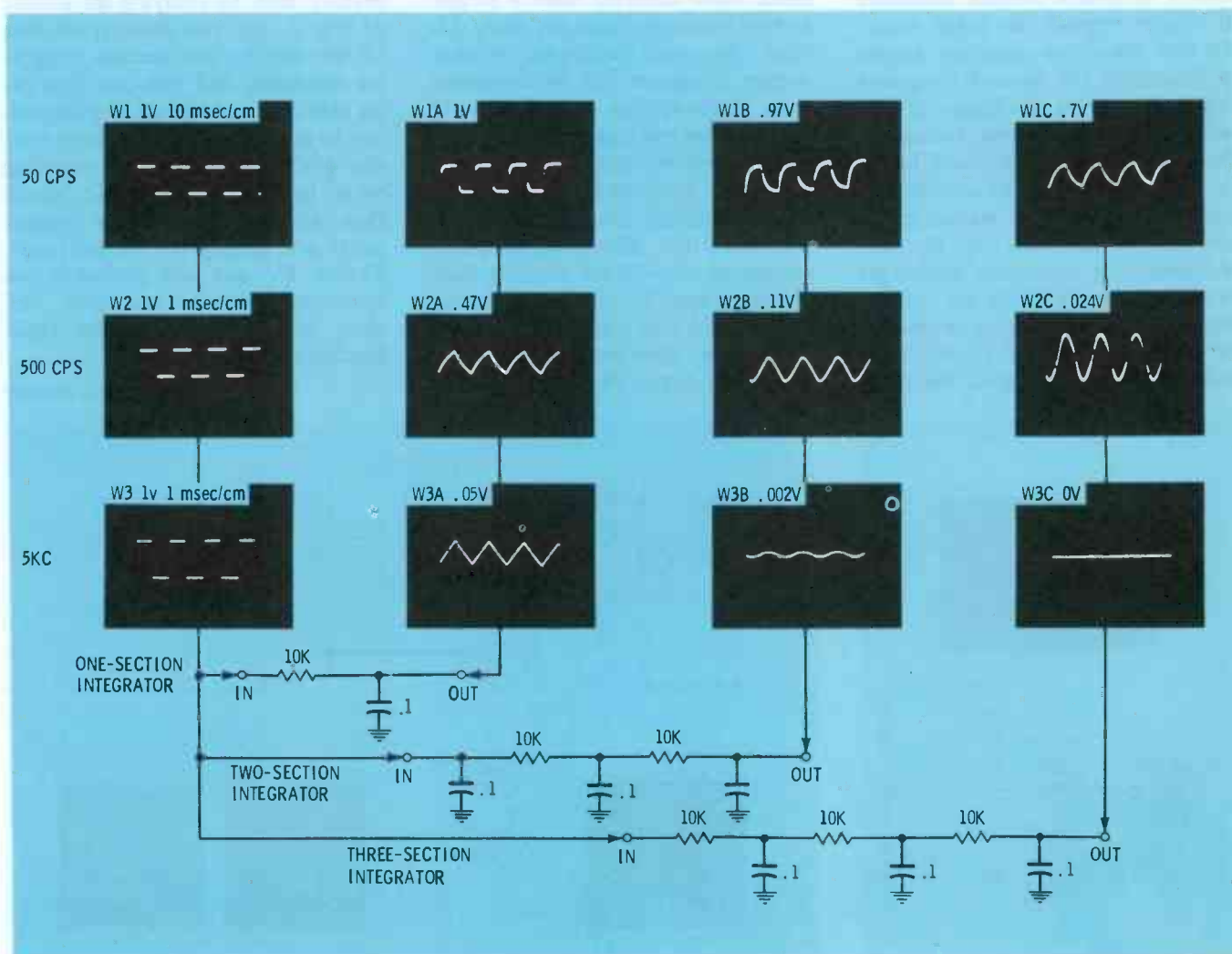


Fig. 2. Successive integration of squarewave input reduces output amplitude and makes waveshape more like a sine wave.

square wave is equal to $\frac{1}{2}$ the p-p input amplitude. (Theoretically an integrator never completely settles, although for all practical purposes it does after several intervals.) The output waveform is referenced to the average DC voltage and shifts above and below this level. In Fig. 3, the larger waveform is taken at point A, while the superimposed smaller waveform is taken at point B. For clarity, the smaller (parabolic) waveform amplitude is increased in reference to the larger; therefore, the amplitude relationships are not to scale. The time bases for both waveforms are identical, and both waveforms are referenced to the same DC level.

The parabolic waveform from point B (Fig. 3) results from integration of the sawtooth waveform. In other words, the capacitor of the second integrator charges toward a sawtooth voltage, not a square wave; an approximately parabolic waveform results. The capacitor in the second integrator section continues to charge beyond the point where the first integrator capacitor begins to discharge; the second integrator finally begins to discharge at the point where the output voltage at the first integrator decreases below the output voltage at the second integrator. The discharge waveshape is also nearly parabolic, and the second-integrator capacitor discharges beyond the point where the first integrator capacitor begins to charge; the second integrator capacitor finally begins to charge at the point

where the first-integrator output voltage increases above the second-integrator output voltage. Relative phases of the input, first-integrator, and second-integrator waveshapes are shifted in this manner.

An RC multisection integrator can be compared to an LC low-pass filter. As input frequency increases, output amplitude decreases. In addition, the amplitude of high-frequency elements of an applied square wave are attenuated more than the low-frequency elements, and the output waveform is similar to a sine wave at the fundamental frequency. Unlike an LC low-pass filter, an RC multisection integrator doesn't have a cutoff frequency. Also, the output-amplitude-vs-frequency curve of a multisection integrator is markedly different from that of an LC low-pass filter.

Testing Multisection Integrators

Since a multisection integrator is much more complex than a single-section integrator, tests are more difficult. In some instances, a two-section integrator can be converted to a single-section integrator, and the rise-time test can be applied. Fig. 4 shows one example.

The PC network in Fig. 4A must be disconnected from its circuit for test. Note that, with terminal 2 disconnected, C1-C2-R3 form a simple integrator; C1 and C2 in series form a .05-mfd capacitor. Use of Thevenin's theorem produces the equivalent circuit of Fig. 4B, where

the value of R4 equals the parallel combination of $R1 + R2$ and $R3$. R1 is added to the circuit so that rise time can be measured; its value is made equal to R2 for convenience. Part of the output waveform is developed across R2; only the top (curved) portion of the output waveform is developed across C1-C2-R3. The straight-line portion of the output waveform isn't visible on the scope at the settings given; increase the input sensitivity and rotate the vertical-position control on your scope until the leading edge of the curved portion is clearly visible. Then measure the interval between 10% and 90% of peak amplitude on the *visible curved portion*. An RC circuit charges between 10% and 90% of peak input amplitude in 2.2 time constants. In this case rise time = 737 msec, and $1/2.2 \times 737 = 335$ msec.

This method is useful for two-section integrators; unfortunately, it isn't applicable to three-section integrators. Still, by studying the photos of Fig. 2, you can develop an idea of the way a three-section integrator functions, and you can then get an idea of its condition by comparison to normal operation. These tests are quite useful for PC coupling units because you needn't wreck them to determine if their components are greatly out of tolerance. Future TV sets will probably use integrated circuits, and tests like these will be necessary for rapid trouble-shooting.

• Please turn to page 69

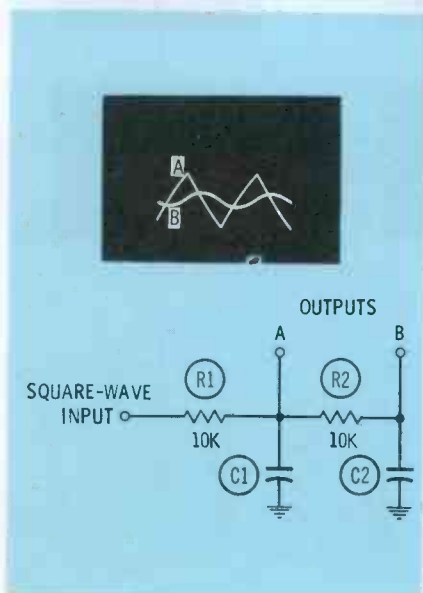


Fig. 3. C2 charges to voltage at C1.

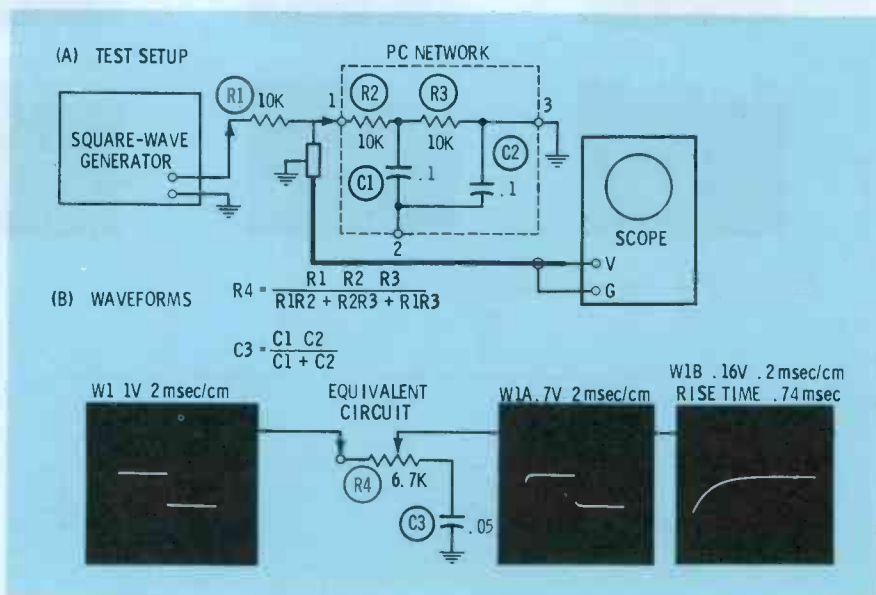


Fig. 4. Two-section integrator set up as one-section unit; rise-time test is used.

REPAIRING THE Small Record Player



by Homer L. Davidson

It is profitable when you do it rapidly.

Generally, the small record player is used by the teenager or the young fry in the family and receives rough treatment. When a customer brings one of these units into the shop for repair, he will usually say, "This record player belongs to Johnny, and I don't want to spend too much on it. Can you give me an estimate? How much will it cost?" Some customers will have the record player repaired if the cost is less than ten dollars; others will spend only a couple of dollars. If the small record

player has an automatic changer and a stereo cartridge, the customer will usually pay more to have it repaired. Also, sentimental values placed on a unit will have a bearing on the limit of repair charges. In any event, a true estimate should be made, not a low one just to get the job.

A serviceman may think that a repair under ten dollars isn't worth fooling with. But, he fails to realize that five of these jobs could gross fifty dollars; ten repairs will ap-

proach a hundred dollars. You can make a profit repairing small record players if the job is completed rapidly and efficiently. Since these small units lack hi-fi characteristics, sound quality is not a major repair factor; however, quick, dependable repair is a must.

Perhaps the primary reason to repair these units is that the customer may also possess a TV set, a car radio, household radios, and a stereo console; of course, all of

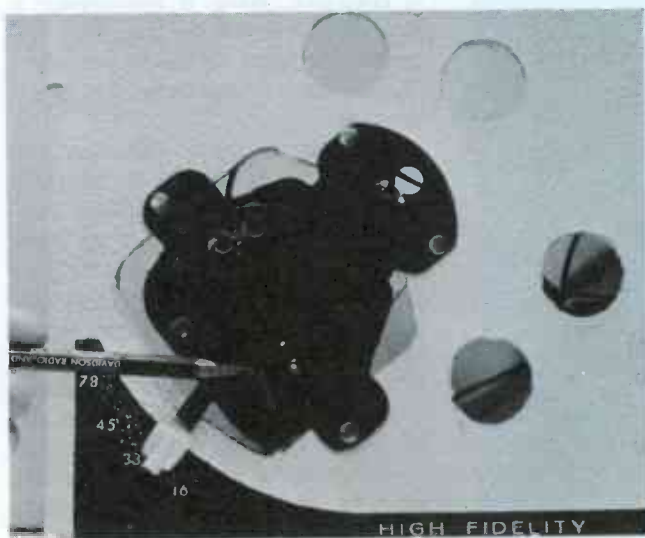


Fig. 1. You can cut off a few turns of the tension spring.

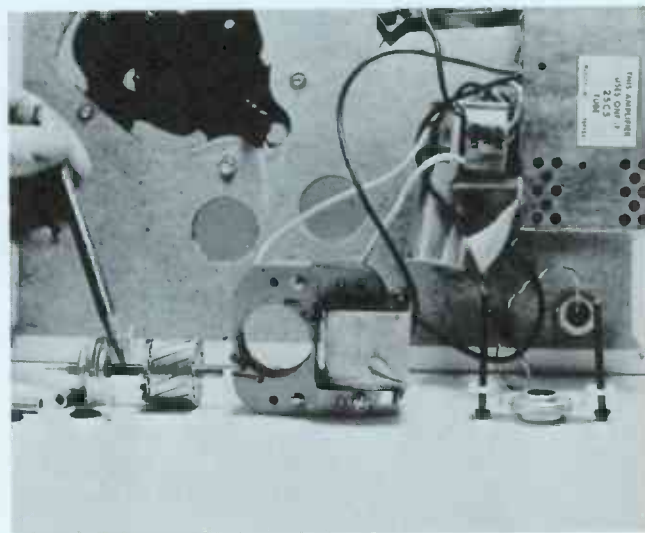


Fig. 2. Be sure to observe closely the field assembly.

successful service shop beats rising costs with B&K television analyst



"As every serviceman knows, major TV repairs represent an increasingly large part of the service business and the average time per repair has increased"...

says Willard Horne of Horne Radio and Television in Evanston, Illinois.

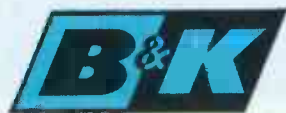
After more than 25 successful years in the service business, twenty of them in the same location, Mr. Horne can be considered an authority on how to keep a business profitable. Mr. Horne says, "In order to be successful, our 3-man shop has to be competitive on the large jobs as well as the small ones. With the increase in bench time that we were experiencing and the limitations on what we could charge, there was a reduction of profit that had to be stopped. Then we bought a B&K Model 1076 Television Analyst."

"Now our customers get the same extra-value service on the big repairs and the small ones," said Mr. Horne. "We use the Television Analyst for troubleshooting a wide variety of complaints, particularly for those that require touch-up align-

ment, location of IF overloads and color convergence. We are more competitive now that we use the B&K Television Analyst because we spend far less time on the jobs that used to be dogs, with benefits both to the shop and our customers."

B&K Model 1076 Television Analyst checks every stage in a black and white or color TV receiver. Nine VHF RF channels, 20 to 45 MC IF, audio, video, sync, bias voltage and AGC keying pulse are available. The model 1076 provides its own standard test pattern, white dot, white line crosshatch, and color bar pattern slide transparencies. It includes a blank slide which can be used for closed-circuit-TV display floor promotion. Its net price is \$329.95.

Find out how you will increase your TV service profits with a B&K Model 1076. See your distributor or write for Catalog AP 22.



B & K MANUFACTURING CO.
DIVISION OF DYNASCAN CORPORATION
1801 W. BELLE PLAINE AVE. • CHICAGO, ILL. 60613

Export: Empire Exporters, 123 Grand St., New York 13, U.S.A.

LASERS



you may encounter

Industrial Electronics—An introduction to light amplifying devices

by William Nelson

Parallel rays of light that drill holes smaller than human hair.

Communications systems transmitting over beams of invisible "light" that spread out less than 6" at a mile.

Pin-point welding of delicate foils with sun-hot light in less than one second of time.

The light that will do these and many more jobs is a new form of light, only five years old. It is generated by a **laser**—a device that harnesses the energy of the atom to produce a light more intense than that generated by nature.

Laser Operation

The primary action of a laser is to emit visible, infrared, or ultra-

violet light when stimulated by optical, radio-frequency, electrical, or other kinds of energy. Most lasers work on the same basic principle. A light-producing material — such as ruby, glass, certain gases, or neodymium-doped calcium tungstate— is stimulated to a high level of internal energy by an outside energy source. This outside energy source can be a powerful photoflash tube as shown in Fig. 1, fired by some type of trigger circuit. Sometimes, a more elaborate trigger-circuit arrangement, such as the circuit of Fig. 2, is used in place of the simple ordinary switch.

Energy for the flash lamps used to excite the laser material is de-

livered by a pulse-forming network composed of capacitor banks as indicated in Fig. 1. This pulse is controlled using a trigger circuit. A power supply capable of delivering 3000 watts of average power replenishes the charge on the capacitors during the laser *interpulse* (between-the-pulse) period.

The physical nature of laser material causes it to produce an intense and narrow beam of in-phase light as the material settles back to rest from its stimulated state of high internal energy. This action is where its name is derived: Light Amplification by Stimulated Emission of Radiation. A unit which emits visible light, using helium-neon gas as the laser material, can be seen in Fig. 3.

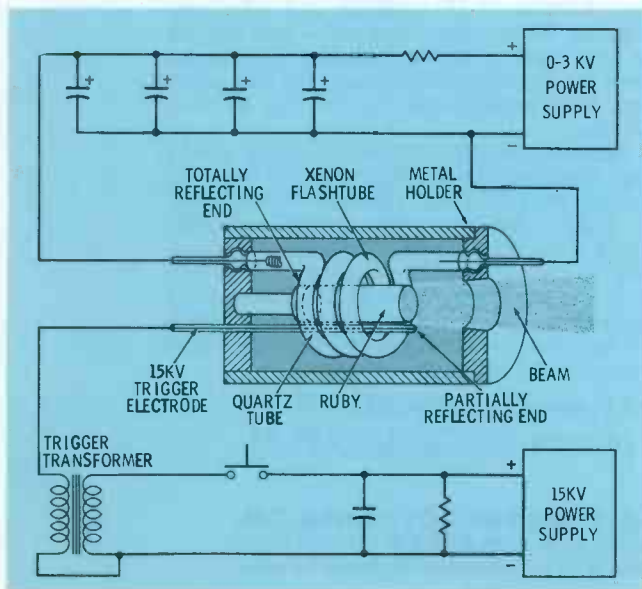


Fig. 1. Schematic of laser and associated circuits.

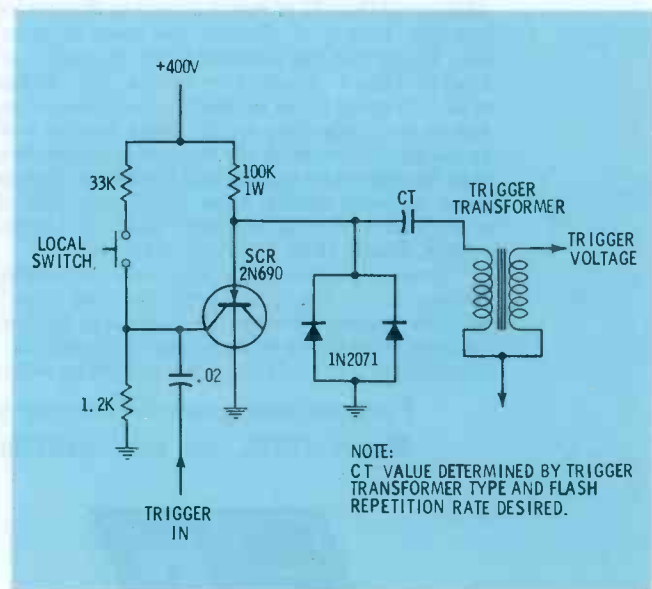


Fig. 2. Diagram of a trigger circuit using an SCR.

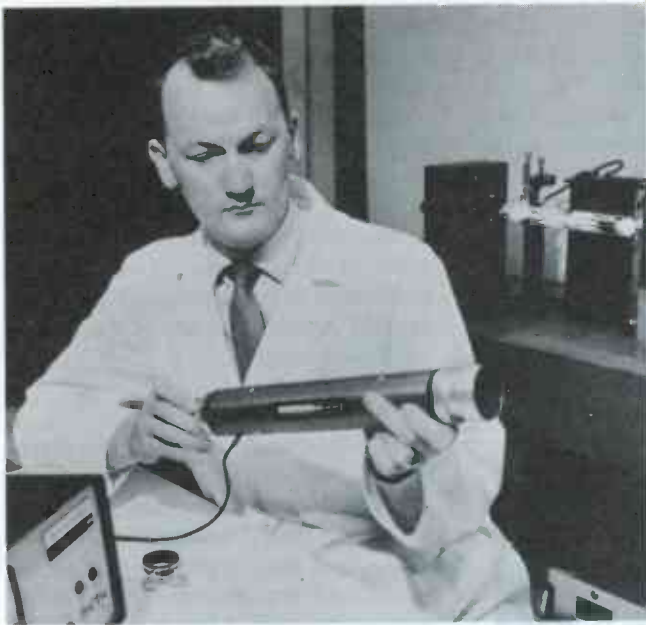


Fig. 3. This laser contains helium and neon gases.

Many Uses

More than 500 industrial firms, universities, and government agencies have moved into development work on lasers with a vast investment of over 750 million dollars. Communication men say that laser bandwidth is broad enough for a single beam to carry all the world's communication channels at the same time. Metallurgists are using the super-hot laser beam for drilling microtiny holes and for precision welding. The military looks to the laser to light the way to advances in radar guidance and searching, surveying, and battlefield range finding. Physicians use lasers to cauterize spots on the retina of the eye and to weld a detached retina, make

openings in cell walls, and to clean cell interiors without damage to the cell walls.

TV Cameras

Combining a laser source with the flying-spot scanning system used in television, a laser camera produces images on an oscilloscope or television receiver screen. This system differs from the conventional television camera because it generates its own light for illuminating the scene being viewed. The laser light reflected by the scene is picked up by sensitive photomultipliers, synchronized, amplified, and applied to the control electrode of a cathode-ray tube. This technique is said to provide better resolution than is

possible using conventional photographic techniques.

Communications

With the use of communication channels doubling every ten years, communications engineers have been working to find some method of transmission which will make possible more channels of information. Into this picture came the laser in 1960. For point-to-point communications systems at ultrahigh information rates or where extreme privacy (or noninterference) is demanded, lasers offer significant advantages over radio systems.

The laser is ideally suited as a communications carrier. Its beam is narrow enough for highly directional aiming and economic use of power.

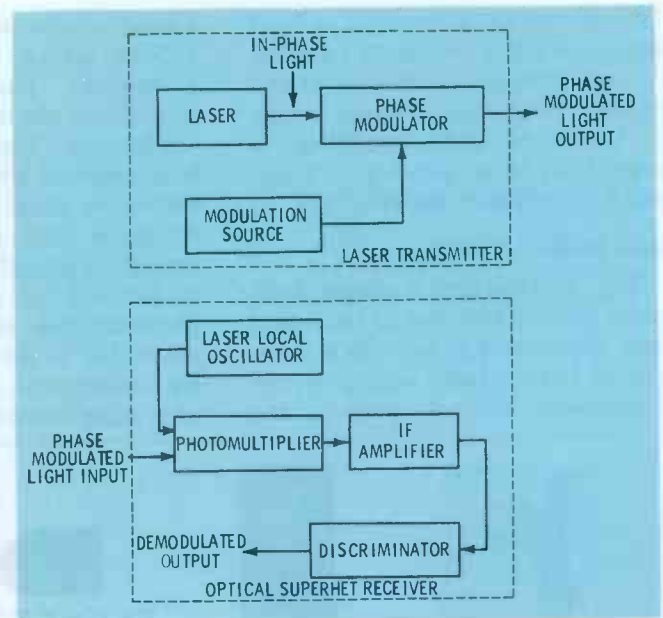


Fig. 4. A communications system that uses a laser.

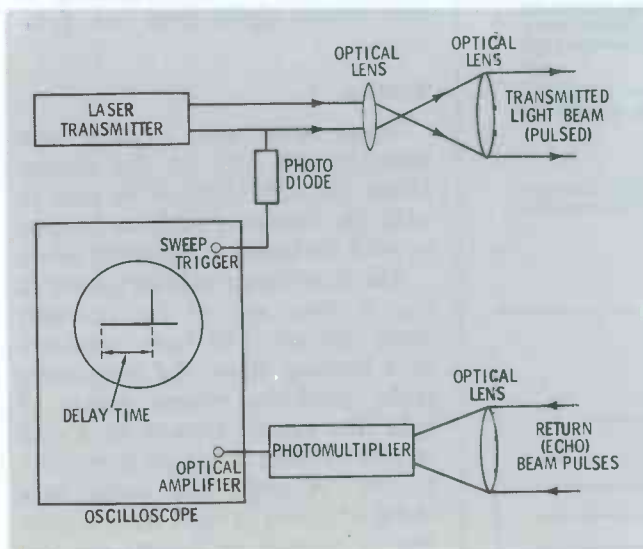


Fig. 5. "Radar" system uses a beam produced by a laser.

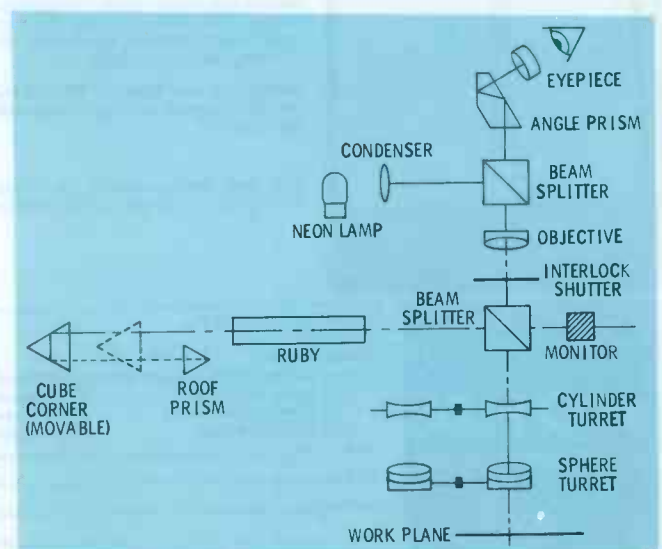


Fig. 6. Diagram of a welding system that uses a laser.

The amount of information a laser beam can carry is almost limitless. A laser communications system can be seen in the block diagram of Fig. 4. Under the right conditions, a single laser beam can have a bandwidth of 100,000 mc (100 gc).

Laser Radar

Fig. 5 illustrates a simple laser radar system. The type of laser used here generates a pulse with a duration of 10 usec and a peak power of 1 megawatt. When the pulse occurs,

a small portion of it is picked off by a beam splitter and directed to a photodiode. The output of this photodiode starts the sweep of an oscilloscope. The laser-beam pulse is transmitted with the light waves exactly in phase (collimated); the return, or echo, signal pulse passes through a second optical system. It is detected by a highly sensitive photomultiplier receiver whose output is fed to the main amplifier of the oscilloscope. By measuring the time delay between initiation of the

sweep and reception of the return signal, the system computes the distance to the target electronically.

Such optical radar can work at very short ranges and have resolutions on the order of 1' or better at 50,000' away. At long range, this is equivalent to a resolution of 22 miles at the distance of the moon; resolution of conventional radar is several hundred miles at such extreme distances.

Laser Gyroscope

The laser may also take the place of the half-century-old mechanical gyroscope as an automatic guidance device for ships, aircraft, and missiles. This laser gyroscope is more stable and sensitive than the older mechanical type. Light waves traveling at a steady 186,000 miles a second give the laser gyroscope its "sense of motion." This light is immune to the forces of gravity which can cause instability and error in mechanical gyroscopes.

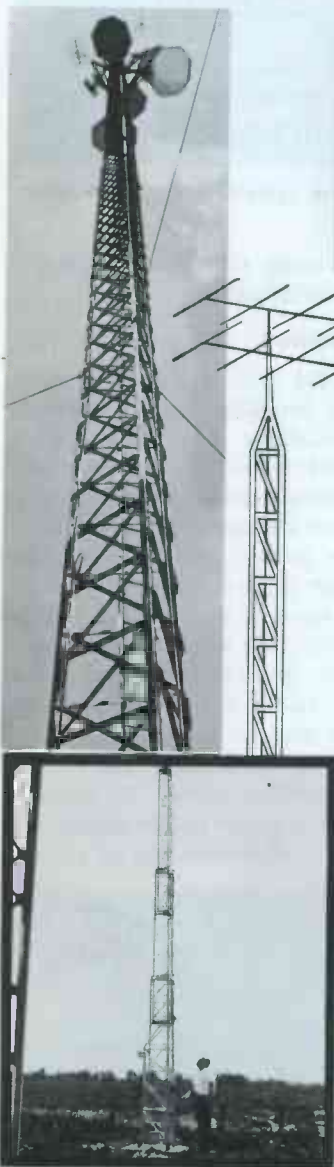
In operation, a laser gyroscope produces two light beams—both at the same frequency—which whirl continuously in opposite directions around a small square ring. At one corner, the light beams are picked off through a partially transparent mirror and fed into light-sensing photodiodes. Any change in the direction, altitude, or attitude of the vehicle to which the laser gyroscope is fixed causes a difference-signal output from the light mixer. This acts as an error signal which automatically operates controls to return the vehicle to its correct path, altitude, or attitude—resulting in zero output again from the gyroscope.

Welding

Since lasers can produce heat more intense than at the surface of the sun, this heat can be used to weld the hardest metals or focused to weld the tiniest of electrical wires.

The laser-beam welding system in Fig. 6 gives one of the strongest welds known. The laser, mounted in a housing above the positioning table, produces intense pulses of light that can be focused to a spot or line variable in length from .04" to .06". A single laser pulse, or a string of pulses at rates from 1 pulse per 12 seconds to 1 pulse per second, can be used.

• Please turn to page 77



The most Famous Name in
TOWERS of ALL KINDS!

Here are the advantages you get when you insist on ROHN TOWERS

LARGEST FULL RANGE OF TOWERS—you can get anything from home TV and amateur radio towers to heavy-duty communication and micro-wave towers. Included are 500 foot self-supporting towers, 1,000 foot guyed towers, "fold-over" and crank-up towers. Regardless of your needs, ROHN can supply it.

UNQUESTIONED LEADERSHIP IN DESIGN AND MANUFACTURE—you get the latest in advanced tower engineering. All communication towers are engineered to EIA specifications, and are proved by thousands of installations. No other manufacturer can surpass the quality and fine reputation of ROHN.

QUALITY MATERIALS AND WORKMANSHIP—Only highest quality steel is used which fully meets the specifications for the job. ROHN towers are hot-dipped galvanized after fabrication—a feature ROHN pioneered!

SERVICE WHEREVER YOU WANT IT—ROHN representatives are world-wide. Complete erection service for communication systems, broadcasting, micro-wave, and other needs is available; also competent engineering service to help you.

Settle for the BEST in TOWERS—ROHN—today the world's largest, exclusive manufacturer of towers of all kinds!

For your needs, contact your local ROHN salesman, distributor or dealer; or write direct for information.

SEND THE HANDY COUPON INDICATING YOUR NEEDS
ROHN
Manufacturing Co.
BOX 2000
PEORIA, ILLINOIS

ROHN Manufacturing Co.
Box 2000
Peoria, Illinois

Send me complete literature on the following ROHN Products:

<input type="checkbox"/> Home TV Towers	<input type="checkbox"/> Amateur Towers
<input type="checkbox"/> Communication Towers	<input type="checkbox"/> AM-FM Broadcasting Towers
<input type="checkbox"/> Micro-Wave Towers	<input type="checkbox"/> Government

Name _____
Firm _____
Address _____
City _____ State _____

Take a look around your shop and in your tube caddies. How many rolls of tape do you have? Are they all the same type? If so, chances are you've run into a situation where the tape you had was not suitable for a specific application. Either it wouldn't stick, or it loosened when exposed to extreme heat or cold. If you have been plagued with such problems, follow along with us as we take a look at some different kinds of electrical tape and point out specific uses for each type.

Using Tape

There are three common types of electrical tape: ordinary vinyl-plastic tape, high-temperature tape, and all-weather tape. Proper application of these tapes is generally a simple matter; however, situations do sometimes exist where a special method of application is helpful.

1. In many applications, you can spiral wrap vinyl-plastic tape over the area to be protected using an overlap equal to about 1/2 the width of the tape (Fig. 1). Apply the tape with the tension necessary to pull it from the roll.
2. When the working area is limited, or in places where high voltages are encountered, it is sometimes easier to cigarette wrap

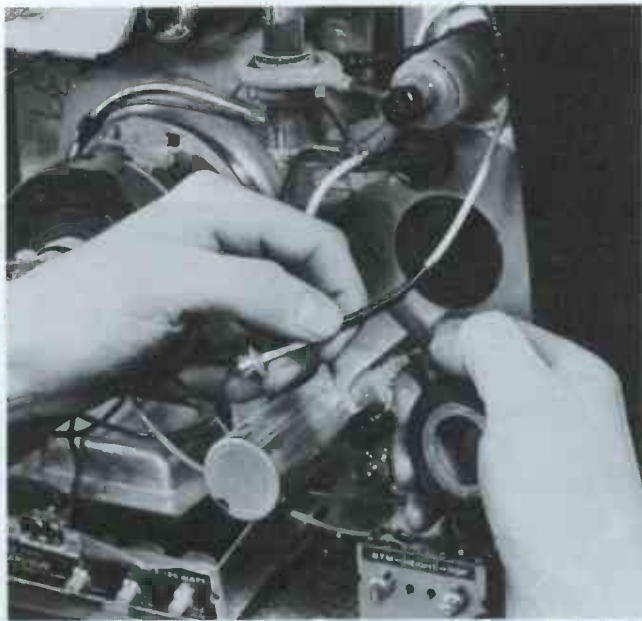


Fig. 1. Spiral wrap with plastic tape should be made to overlap each turn by approximately one-half tape width.

uses for

ELECTRICAL

TAPE

There are hundreds — here are some for service shops.

by James Welch

3. Where high temperatures are present, as around high-voltage transformers and some tubes, an electrical tape with a glass-cloth backing and a thermosetting adhesive usually performs most satisfactorily.
4. When the repair will be exposed

to low temperatures, use an all-weather vinyl-plastic tape.

Having looked at the three basic types of tape and how to apply them best, let's examine some of their specific uses.

Splice Insulation

Whenever two wires are spliced by twisting, soldering, or a metallic connector, a plastic tape will provide the electrical insulation, mechanical protection, and moisture

Fig. 2. A stronger and safe repair job can be performed by first wrapping the damaged area with a cigarette wrap.

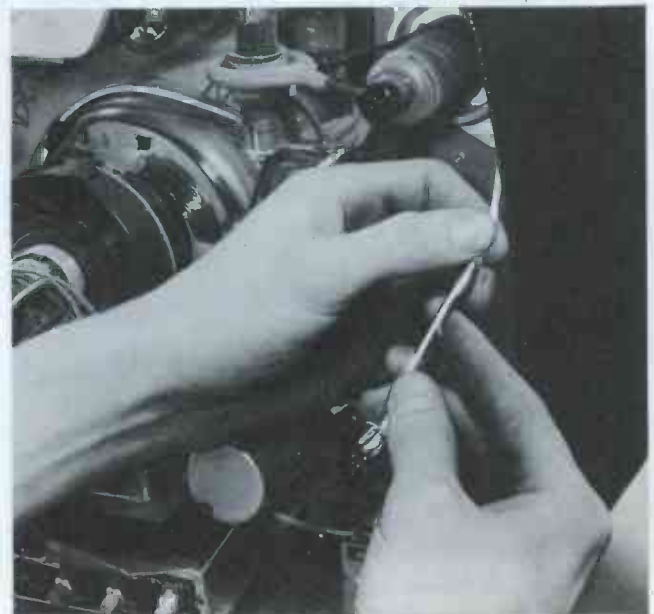




Fig. 3. Typical tape wrap of a circuit splice for better insulation and added protection.

and corrosion resistance necessary at this critical point. A spiral wrap will seal and insulate the connection (Fig. 3).

Wire Harnessing

When it is necessary for you to replace components or wires, or to modify a circuit, the factory harnessing of a group of wires is usually disturbed. Fig. 4 shows how simple it is to reharness this group of wires. Spot taping or an open spiral is sufficient to hold wires. In cases where the wires may be exposed to cleaning fluid, oil, etc., use a 1/2-lapped closed spiral for protection.

Component Isolation, Insulation

Often in the closely entwined circuitry of the modern radio or television set, terminals and leads are so closely spaced that normal vibration can cause a short circuit. This

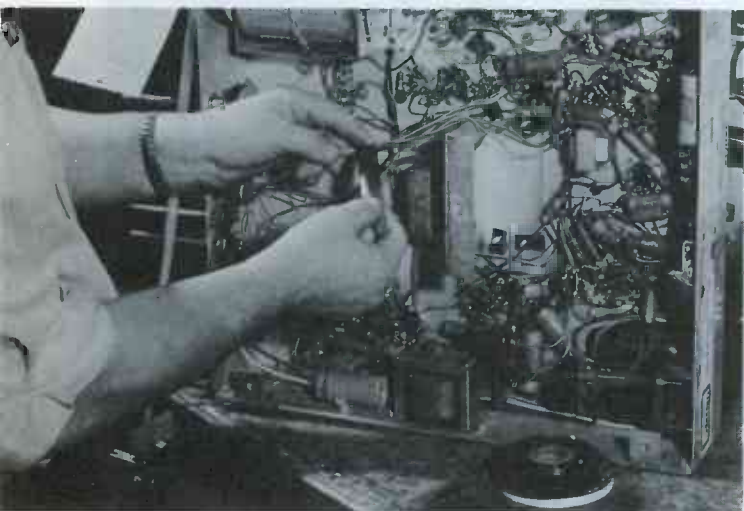


Fig. 4. Using electrical tape to harness a group of wires located on the under-chassis side of a typical television set.

situation can well be intermittent, making the location of the trouble difficult. You can eliminate the problem by insulating with tape any leads that are likely to short; see the example in Fig. 5.

Insulating Filter Capacitors

Sometimes you'll find that a replacement electrolytic capacitor does not have the fiber insulating sleeve that is normally a part of new equipment. In some cases the sleeves can be salvaged from the original can, or sleeves that will fit can be purchased. In those instances where it is impossible to obtain a usable sleeve, the electrical characteristics of plastic tape provide the answer to the problem (Fig. 6) and reduce the necessity of carrying a large inventory of fiber sleeves.

High-Voltage Lead

In many television sets, especially portable models, the high-voltage anode lead passes through hole cut in a vertically mounted chassis. The



Fig. 6. Electrical tape can serve as an insulating sleeve on replacement of electrolytic capacitors.

general flexing of this lead caused by movement of the set or movement of the lead during repair contributes to the ultimate breakdown of the insulation. Once this deterioration begins, it is accelerated by the corona effect of the high voltage present on the wire. Eventually, replacement of the lead is necessary. However, arcing from this lead can be eliminated temporarily by cigarette wrapping (see Fig. 2) the problem area and spiral overwrapping with tape as shown in Fig. 7. Remember, though, this tape insulation is only a minimal barrier intended to reduce the arcing distance of the high voltage. Avoid making contact with the anode lead while the set is operating—you could receive a severe and embarrassing shock.

Cushioning Capacitor Straps

Cushioning of capacitor straps takes in a wide range of applications dealing primarily with building up the body of electrolytic ca-

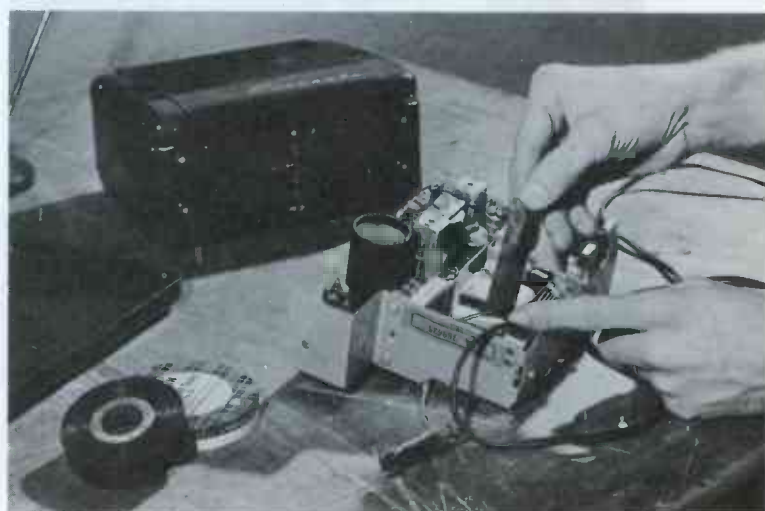


Fig. 5. Short length of electrical tape protects circuit against shorts caused by vibration of parts within chassis.



Fig. 7. Example of wrapping the high-voltage lead to prolong circuit life.

capacitors to insure their proper positioning and security on the chassis. The problem of looseness generally develops as a result of technological advances that decrease the size of replacement units. However, the problem can also arise when other than specified parts are used for some reason.

Often, the metal clip designed to hold the capacitor in place just will not lend itself to the bending necessary to do the job. A few turns of tape around the capacitor and then around the clip will fill the empty space and provide a snug fit. When a holding strap is not provided, wrap a short length of tape around the capacitor, and leave a small tab extending from the body of the unit. Punch a hole in the tab, and mount the capacitor with a screw and nut.

Picture-Tube Straps

The positioning of picture-tube holding straps and cushioning is often a critical factor in maintaining correct alignment of the tube. All new television receivers are provided with a cushioning material beneath the strap and around the tube. This allows for tension on the strap without tube breakage and prevents slippage of the tube or holding straps.

When this material, due to age or tube replacement, is no longer functional, install your own cushioning. A few layers of tape provide an excellent cushion and eliminate tube slippage.

Picture-Tube Base

Intermittent filament contact on old television picture tubes is often

caused by a loose tube base. You can correct this by securing the base to the glass envelope with a piece of tape. In this application, use a tape that withstands high temperatures.

Buildup for Tuner Cams

Extended use of cam-operated tuning systems results in wear of the cam, piston, or both, creating looseness in the tuning system, intermittent contact, and inefficient operation. These worn parts can be beefed up to their original dimensions by wrapping them with tape.

Repair of Ion Trap

When the spring in the ion trap becomes distorted to a point that slippage is more the rule than the exception, try covering the area of its location on the neck of the tube with a layer of electrical tape. The tape acts as a filler to take up the slack in the spring and provides a more stable base for the ion trap, thus reducing the probability of slippage.

Lead-In Protection

The exposure of the television antenna, particularly the lead-in cable, to atmospheric conditions is an almost inevitable companion to the improvement in reception. However, electrolytic corrosion, moisture, and wind damage can cause rapid deterioration of the antenna-system efficiently.

Sealing the ends of the lead-in cable at the antenna and at the set, sealing the antenna-to-lead-in con-

• Please turn to page 68

3 WAYS TO BIGGER



NEEDLE



CARTRIDGE PROFITS!

1. More "look-alike" exact replacement models than any other brand. Over 350 needles, 225 cartridges.

2. Easy-to-use reference material. E-V computer-printed catalogs make proper needle/cartridge selection easy, fast and accurate.

3. Highest standards. Rigid quality control and inspection cuts call-backs, gives full value to every customer.

Stock and sell E-V needles and cartridges for more profits. Pick up your FREE replacement guide at your nearby Electro-Voice distributor today!

ELECTRO-VOICE, INC.

Dpt. 167R 632 Cecil St. Buchanan, Michigan 49107

Electro-Voice
SETTING NEW STANDARDS IN SOUND



**Most companies
would be satisfied to double sales.**

Not Winegard

True, Winegard sales doubled in '65. So did the number of Winegard employees. We added some 60,000 sq. feet of production space. And we advertised more than ever before—with thousands of TV commercials (color and black & white) and with big, hard selling ads in *Life*, *Parade* and *Sunset*.

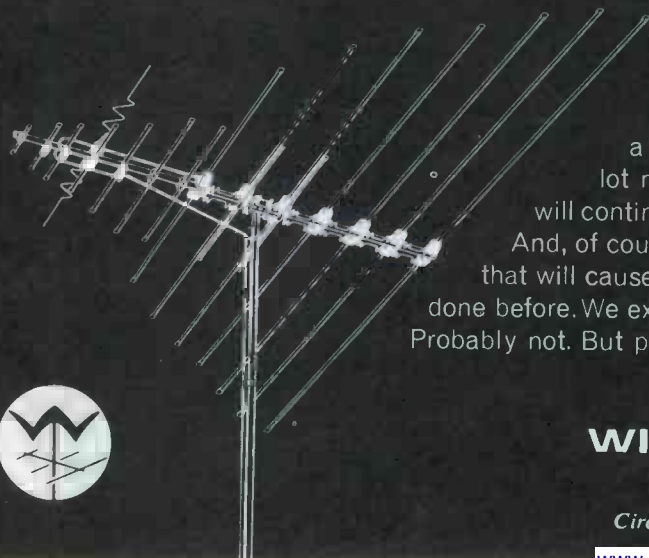
But that was last year. And a company doesn't continue to be the leader in its field by being satisfied with what happened last year. That's why Winegard will have even more production, assembly and office space this year. That's why there will be a lot more people working a lot more hours to make and deliver a lot more of the best antennas available. And that's why Winegard will continue to do more advertising than any other antenna manufacturer. And, of course, there will be some new antennas and a few other surprises that will cause more excitement (and sales) than anything Winegard has ever done before. We expect to at least double sales again in 1966. Will we be satisfied? Probably not. But people who buy Winegard products will be. And so will people who sell and install them. We hope that includes you.

WINEGARD ANTENNA SYSTEMS

WINEGARD CO. • 3000 Kirkwood • Burlington, Iowa 52602

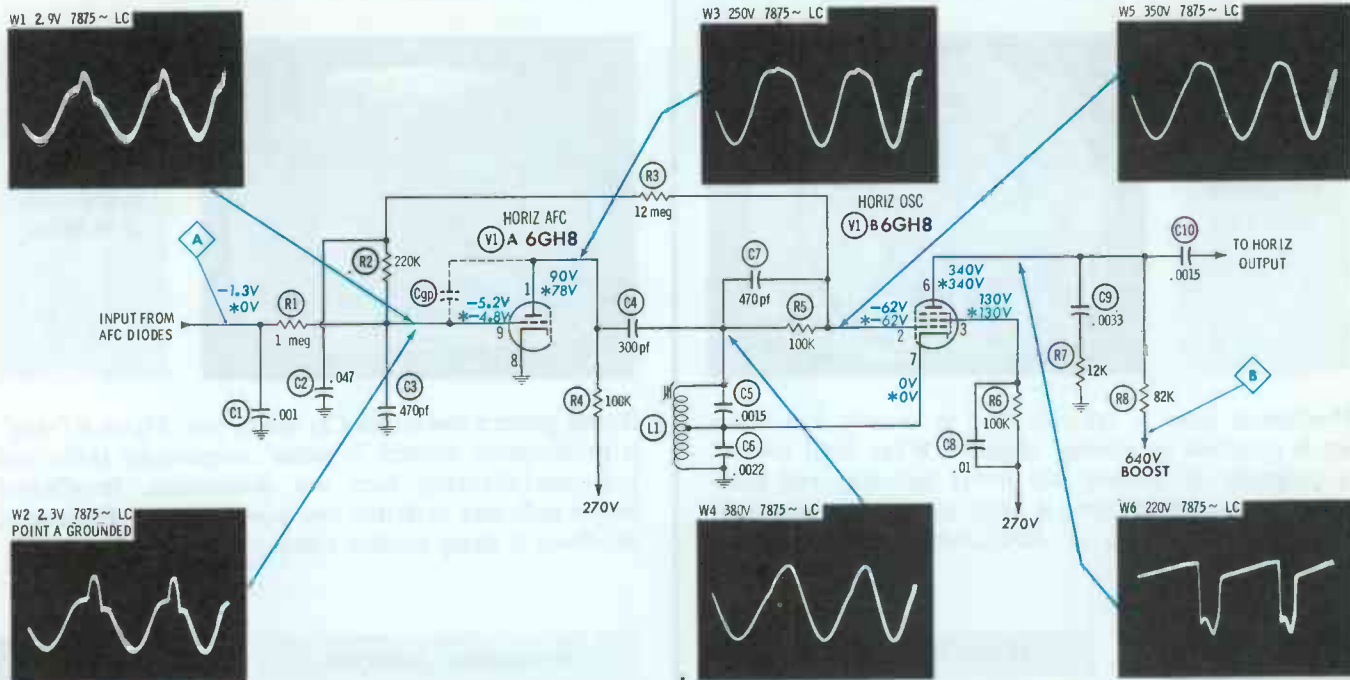
Circle 13 on literature card

www.americanradiohistory.com





Sine-Wave Electron-Coupled



DC VOLTAGES taken with VTVM, on inactive channel; antenna terminals shorted. *Indicates voltages taken with signal present—see "Operating Variations."

WAVEFORMS taken with wideband scope; hold control set at midrange for 0 volts at AFC-diode input. Low-cap probe (LC) used to obtain all waveforms.

Normal Operation

Sine-wave oscillator V1B, like *Synchroguide* and multi-vibrator circuits, generates 15,750-cps drive signal for horizontal-output tube. To prevent load variations of class-C output stage from affecting L1-C5-C6 tank frequency, V1B screen grid shields tank from plate circuit. Oscillation is sustained by triode comprising screen grid, control grid, and cathode. Both inductive and capacitive halves of tank circuit are tapped to provide voltage step up at grid necessary for oscillation. As oscillator operates class-C, C7 and R5 are employed for grid-leak bias. Waveform at V1B plate results because tube is cut off for major portion of negative cycle at grid; charging of RC circuit C9-R7 causes sawtooth at waveform top. Tank frequency is controlled by hold-control slug and action of AFC-control tube V1A. C4 and V1A form shunt capacitive path between oscillator tank circuit and ground. V1A conduction controls current through C4 and therefore determines effective shunt capacitance value. DC voltage taken from V1B grid via R3 and R2 (C2 bypasses AC component) sets operating point for V1A grid; AFC-diode input voltage then causes V1A negative bias to shift above or below this point, controlling V1A conduction. Oscillator frequency is controlled as V1A conduction varies effect of shunt capacitance (C4) on oscillator tank; frequency is thus regulated by DC voltage from AFC diodes. Signal at V1A grid results from plate-signal coupling through plate-to-grid capacitance Cgp. Altered wave-shape results from differentiation.

Operating Variations

PINS 1, 9

With receiver synced on station signal, DC voltage varies with position of hold control. Pin 1 range is 160 volts, control CW, to -4 volts, control CCW. Tube conduction clamps positive-going portion of tank signal at plate; negative-going portion is undisturbed. Consequently, average DC level goes negative as tube conduction increases. At pin 9, receiver synced, rotation of hold control causes shift from -9.8 volts CW to -1.5 volts CCW.

PINS 2, 3, 6

Voltages are independent of station-signal presence. As hold control is rotated from center position, pin 2 goes more negative at maximum CW or CCW position to -66 volts; pin 3 voltage remains constant. Pin 6 voltage depends upon boost supply; range is from 320 to 360 volts.

A, B

At point A, with receiver synced, hold-control rotation causes shift from -6.2 volts CW to 4.6 volts CCW. At point B, oscillator not synced, voltage ranges from 580, hold control maximum CW, to 700, maximum CCW.

WAVEFORMS

Receiver synced, W3 and thus W1 amplitudes vary with hold control position. P-P voltages are: hold control CW—W1, 2.4 and W3, 220; CCW—W1, 3.2 and W3, 340. W2 (point A grounded) doesn't vary during normal operation or during out-of-sync condition.

Horizontal Sync Critical

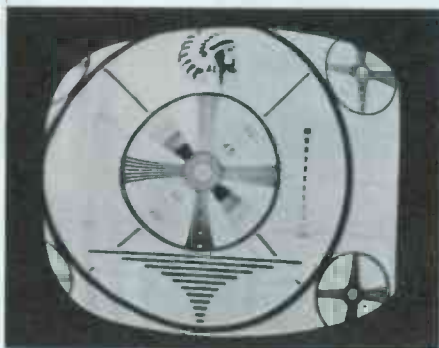
Pix Jitters

C3 Leaky

(V1A Grid-Circuit Capacitor—470 pf)

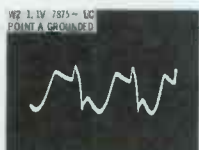
Symptom 1

Symptom Analysis



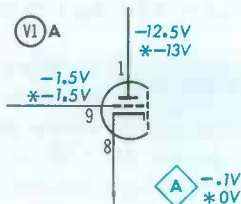
Horizontal sync is critical; sync is usually lost when set is switched to another channel. When hold control is properly set, picture still jitters and may roll horizontally. As vertical sync is okay, symptom seems indicative of AFC-diode or AFC-control-tube trouble.

Waveform Analysis



Waveshape at control-tube grid (W1) is greatly altered, and amplitude is reduced to 1.2 volts p-p. Grounding AFC-diode input doesn't change (W2) waveshape; hence, trouble is localized to V1A circuit. W3 at V1A plate isn't changed, but rotation of hold control has no effect on amplitude. Normally, p-p amplitude varies from 220 volts (hold control CW) to 340 volts (hold control CCW). Trouble is likely in V1A grid circuit.

Voltage and Component Analysis



With-signal voltage at point A (ungrounded) is normal. Significant clue is voltage at pin 9, V1A grid. Normally, rotation of hold control causes change from -1.5 to -9.8 volts at pin 9; now, change is only .1 volt. Resistance check at V1A grid reveals 30K resistance to ground—path via R1 and AFC diodes to ground is at least 1 meg. Disconnecting C3 causes resistance-reading increase to 1.8 meg. Replacement of C3 restores normal operation. Negative plate voltage results from presence of 210-volt p-p tank signal.

Best Bet: Voltage, then resistance checks.

"Christmas-Tree" Effect

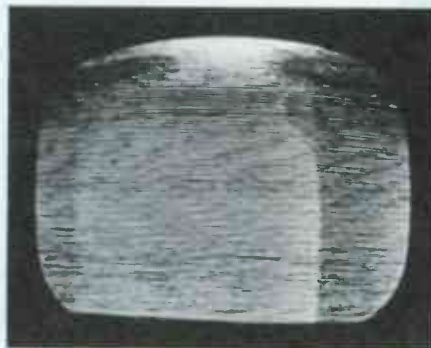
Height Insufficient

R5 Increased in Value

(V1B Grid-Leak Resistor—100K)

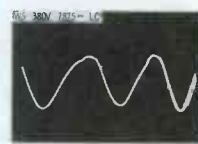
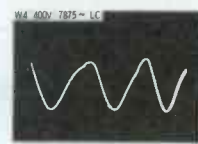
Symptom 2

Symptom Analysis



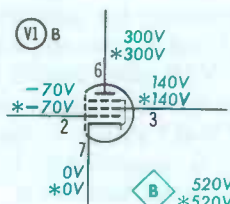
Raster pattern resembles Christmas tree. Flyback "sing" is pronounced. Pattern in raster occasionally shifts and horizontal-blanking bars are discernible. Insufficient height indicates probable low boost voltage. Horizontal oscillator is likely trouble source.

Waveform Analysis



Grounding point A has no effect on raster pattern; W2 amplitude and waveshape aren't normal, but this gives little help. Big clues are waveshapes across oscillator tank (W4) and at grid (W5). Fact that succeeding cycles have different shapes and amplitudes indicates that oscillator is operating simultaneously at two different frequencies or "squegging." Likely cause is excessive grid bias which blocks oscillator and causes erratic action.

Voltage and Component Analysis



Increased negative bias on V1B control grid accompanied by decreased plate voltage seems contradictory until plate supply (point B) is checked: it's decreased to 520 volts. Malfunctioning oscillator is upsetting flyback action and reducing boost voltage. Screen-grid voltage increase results from more negative control-grid voltage. Pin 2 voltage depends upon time-constant ratio between C7 charge path—via pins 2,7 to ground—and discharge path R5. Increase of R5 value to, in this case, 250K increased bias causing squegging.

Best Bet: Scope, VTVM find; ohmmeter confirms.

Horizontal Rolling

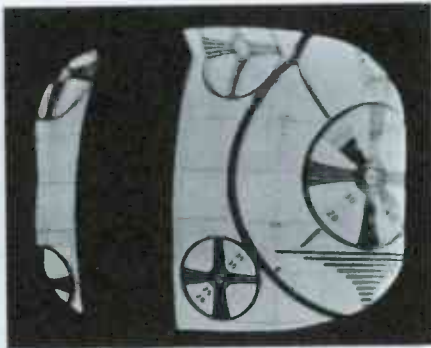
Hold Control Near CW Stop

Symptom 3

R4 Increased in Value

(V1A Plate Resistor—100K)

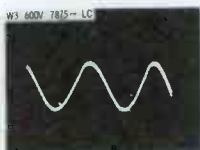
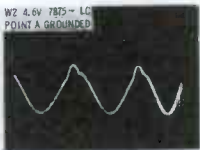
Symptom Analysis



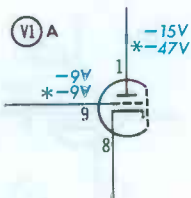
Picture jitters constantly and occasionally rolls horizontally. Horizontal sync is completely lost during station breaks or if channel is changed; vertical sync remains stable. Hold control must be turned almost fully CW for horizontal sync.

Waveform Analysis

Picture remains almost synced with point A grounded; trouble doesn't precede V1A circuits. W2 waveshape isn't normal; spike at top rides at front, not center, of waveform. Amplitude at W2 is increased to 4.6 volts p-p. At W3, amplitude and waveshape are also changed—amplitude increase is to 600 volts p-p. Rounded waveform top at W3 indicates that tube conduction is decreased. W4 indicates p-p tank signal is increased.



Voltage and Component Analysis



Point A grounded, plate voltage is -47 . As point A voltage with signal is 0 Volts (ground potential), abnormal plate voltage gives important clue. Point A ungrounded, with-signal voltage at pin 9 swings from -2 to -11 as hold control is rotated slightly; grid-voltage change is accompanied by swing from -140 to $+40$ volts at plate. In addition, without-signal voltage at plate is decreased from normal $+90$ to -15 volts. More negative voltage at plate points to R4 defect; resistance checks verify value increase to $800K$.

Best Bet: Scope aids; voltage, resistance checks detect.

Horizontal Sync Lost

Drive Line Visible

Symptom 4

C7 Leaky

(V1B Grid-Leak Capacitor—470 pf)

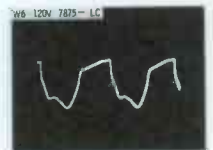
Symptom Analysis



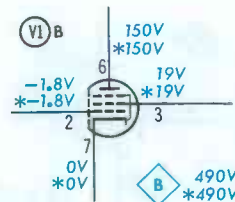
Picture won't sync horizontally, although it approaches synced condition if hold control is turned full YCCW. Brightness is low; drive line in center of picture is visible. Definitely, horizontal oscillator is far off-frequency; drive line gives hint that output is low.

Waveform Analysis

Grounding point A doesn't affect picture — AFC-diode input is okay. Check at oscillator output (W6) reveals low amplitude and distorted waveshape which is cause for drive line. Valuable clue is found from W4 and W5; amplitudes are low and waveshapes are identical. Flattening of waveform lagging edges indicates grid current. Normally, W4 waveform top is rounded; similarity to W5 is strong indication of low-resistance path across C7-R5.



Voltage and Component Analysis



Reduced V1B plate voltage partially results from decreased boost voltage, point B. Plate voltage source is boost supply, which is dependent upon oscillator output. Decreased screen-grid voltage results from greatly reduced negative grid bias (-1.8 volts). Tank signal amplitude and C7-R5 time constant determine negative grid bias. In oscillator circuit, control grid and screen grid circuits interact preventing clearcut voltage analysis. Resistance check across R5-C7 reveals 500 ohms, not $100K$. C7 is undoubtedly leaky.

Best Bet: Scope and resistance checks.

Horizontal Foldover

Symptom 5

Width Insufficient

C9 Decreased in Value

(Waveshaping Capacitor—.0033 mfd)

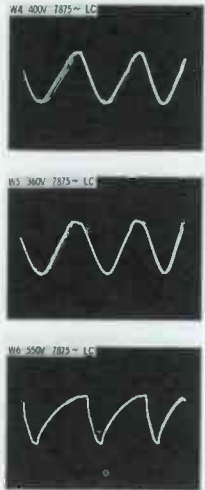
Symptom Analysis



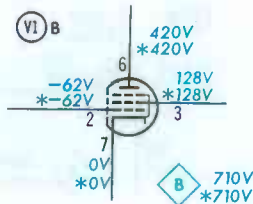
Center of picture shows severe horizontal foldover; also, width is insufficient. Fact that other circuits operate normally clears power supply. Picture is in sync; hold-control action is normal—AFC circuits seem okay. Trouble is most likely in oscillator circuit.

Waveform Analysis

W4 waveshape is normal; p-p amplitude is increased to 400 volts, which isn't definite sign of trouble. Despite 10-volt p-p increase, waveform at V1B grid (W5) gives clear indication that oscillator tank circuit is functioning properly. Trouble spot is found at pin 6 (plate); W6 shows drive to horizontal-output tube is severely integrated and p-p amplitude is increased to 550 volts. Component defect in V1B plate circuit is most likely trouble.



Voltage and Component Analysis



Voltage clues give little help; Plate-voltage increase results from increased boost-supply voltage (point B); all other voltages are within tolerance. Component checks reveal that C9 is decreased in value to 200 pf; replacing it restores normal sweep. Normally, major portion of drive signal is developed across R9; result is steep leading edge of drive-signal waveform. With C9 valve decrease, greatest part of drive signal is developed across high capacitive reactance—integrated waveform results.

Best Bet: Waveform and component analysis.

Width Insufficient

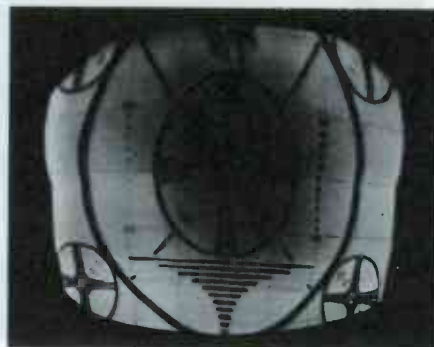
Horizontal and Vertical Linearity Poor

R6 Increased in Value

(V1B Screen-Grid Resistor—100K)

Symptom 6

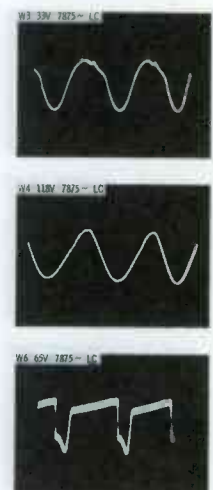
Symptom Analysis



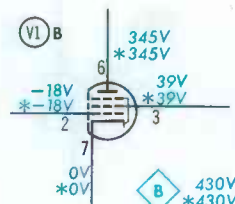
Both horizontal and vertical linearity are poor; picture is overscanned vertically. Attempt to increase width with control causes vertical compression. Picture blooms severely as brightness control is advanced. Sync is okay; horizontal-output or oscillator fault is likely.

Waveform Analysis

Checks at V1A give little help: p-p amplitude at grid (not shown) with and without point A grounded is reduced; plate (W3) amplitude is reduced to 33 volts p-p. Signal across tank (W4) has normal waveshape, but amplitude is decreased to 118 volts p-p. Output signal at plate (W6) has normal waveshape also, but p-p amplitude is decreased to 65 volts. Normal waveshape at W6 clears plate-circuit components; reduced tank signal seems at fault.



Voltage and Component Analysis



V1B plate voltage seems normal until compared to boost voltage, point B. Reduced drop across R8 indicates decreased tube conduction despite reduced negative grid bias. Voltage reduction at pin 3, screen grid, is contradictory; drop across R6 indicates increased current from tube conduction or increase in resistance. Ohmmeter check verifies that R6 is increased in value to 1 meg. Screen-grid voltage decrease reduces feedback signal to tank circuit and p-p tank signal then decreases, reducing drive to horizontal output.

Best Bet: Scope, then voltage and resistance checks.

YOU GET PRODUCT PLUS FROM YOUR SYLVANIA DISTRIBUTOR.

He'll put you in TV Guide



To give you a jump on color set repairs, your Sylvania distributor will put your name, your town, your phone number in *TV Guide*. Four ads will run this year exclusively for Independent Service Dealers carrying Sylvania's picture tubes and receiving tubes.

The plug for you will be run in localized, full-color double-page ads. Customers learn that you're the "right TV serviceman" for color set repairs. For all TV repairs.

And because you're Independent, they learn you give unbiased opinions on TV replacement parts. Sylvania knows that, more often than not, you recommend Sylvania tubes.

See your Independent Sylvania distributor. He'll tell you how Sylvania ads, featuring *you*, can make you your area's "right TV serviceman" for color sets. He'll tell you how to get into up to 4 *TV Guide* ads.

Sylvania Electronic Tube Division, Electronic Components Group, Seneca Falls, N. Y. 13148.

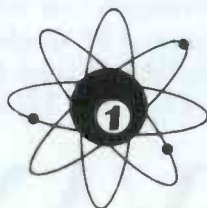
SYLVANIA
SUBSIDIARY OF
GENERAL TELEPHONE & ELECTRONICS **GTE**

Circle 14 on literature card

January, 1966/PF REPORTER 47

**HERE'S
YOUR NEW
1966 FULL LINE
CATALOG FROM SENCORE**

The most complete line of time saving test equipment in America today . . . everything from filament checkers to field strength meters. Tops in performance, portability, and price. All steel construction with look alike design equips you with the most rugged equipment possible for field use but with that truly professional appearance when on your bench. You can't go wrong. Select a Sencore tester from the catalog now and talk to your Sencore distributor tomorrow; the price is right for every budget.



SENCORE

NO. 1 MANUFACTURER OF ELECTRONIC MAINTENANCE EQUIPMENT

426 SOUTH WESTGATE DRIVE, ADDISON, ILLINOIS 60101

Circle 15 on literature card

professional time saving, money making test instruments from:

SENCORE



America's Most Popular
Tube Testers



Industry Standard in
Color TV Analyzers

All Transistorized —
Portable Color Pattern
Generators



High Performance
Broad Band Scopes



FM Multiplex Servicing
Simplified



Tops in TV-FM Field
Strength Measurements

professional quality - that's the difference

SENCORE ■ 426 South Westgate Drive — Addison, Illinois

TUBE CHECKERS FROM SENCORE

Fill every need . . . house calls, bench service or customer self-service!



When it comes to tube checking, professional servicemen rely on the famous Sencore "Mighty Mite," America's most popular tube tester. Tests more than 3000 tubes — including Nuvistors, Compactrons, 10-pins, Novars, Magnovals and all foreign tubes — with a big, easy-reading, burn-out and stick-proof meter. Easy to read, speedy set-up booklet makes every test fast and sure. Uses 100-megohm grid leakage sensitivity to find the "tricky" tubes other testers miss; tests for all inter-element shorts; makes cathode emission tests under full operating levels. Fast, accurate, thorough — that's the Mighty Mite; it will never let you down!



TC136 Mighty Mite IV Tube Checker — The latest, most improved version of the famous Mighty Mite, the leader among tube checkers because it has the versatility and durability professional servicemen demand! Checks them all, including Compactrons, Novars, Nuvistors, Frame grid tubes, and now the latest 10 pin tubes by Amperex and Mullard such as the 6U9, 6Y9, 6W9, and others now being used in the newest color TV sets. Picks out the trouble makers other checkers miss. Tests Nuvistors and Frame grid tubes at lower potentials to prevent damage to the tube. Unique shorts test checks each and every element. Costly VTVM circuit and moving coil meter check for grid contamination and gas at sensitivities of over 100 megohms. New third hand set-up book holder cuts set-up time and speeds tube testing. All steel construction with new detachable hinged cover and taut band meter for extreme durability. The Mighty Mite is positively your "Best Buy" in tube checkers.

10"x9"x3½", 9 lbs. **\$74.50**

TC131 Semi-Automatic Tube Checker — The "Counter/Bench" version of the famous Mighty Mite Tester above, designed for two-way use — as a professional shop tester and customer self-service unit. Semi-automatic; simply turn function control to any test and watch lighted arrow on big, 6-inch meter stop on right scale — user can't go wrong, no neon lights or guesswork — everything is read on meter. Only 3 set-up controls. A money-making traffic-builder. Fits standard 24-inch counter.

21"x22"x4½", 20 pounds **\$129.95**



TC131

SEE YOUR SENCORE DISTRIBUTOR
FOR \$30.00 TRADE-IN DEAL ON TC131.

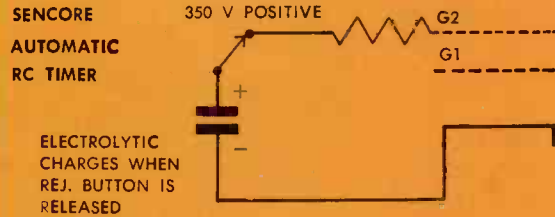


CRT CHECKERS & REJUVENATORS



CR133

Test Any Color or B&W TV Picture Tube with a Sencore CRT Checker — Still the top income-producer for the serviceman. Sencore offers two models with all the latest features and sockets for fast, sure testing of conventional B & W, new low drive B & W, round Color and new rectangular Color tubes. Each Sencore instrument checks CRT emission, inter-element shorts, control grid cut-off capabilities, gas, and expected life.



Applies exclusive automatically controlled (ACR) voltage as required by individual tube condition (precisely timed to prevent over-rejuvenation or tube damage). This is most useful for color tube current equalization to insure proper tracking.

CR133 CRT Checker & Rejuvenator — The compact, lightweight CR133 checks all present picture tubes and is ready for future tubes, too! Has exclusive variable G2 Voltage from 25 to 325 Volts to protect against obsolescence. Two replaceable plug-in cables, one for Color and one for B & W, have all sockets required — no messy adaptors. AC Line Voltage Adjustment guarantees most accurate CRT tests possible; recommended for Color CRT checks. Color guns are individually tested as recommended by manufacturers. Uses well-filtered DC for all checks to avoid damage and reading errors. Hand-wired and steel-encased for protection of meter and panel in truck or shop. The advanced-design CR133 is only, 10"x9"x3½", 10 pounds. **\$89.95**

CR128A CRT Checker & Rejuvenator — The new improved version of the famous CR128. Now has a variable G2 control of 25 to 325 VDC to insure more accurate checks on the latest picture tubes. Similar to CR133 except does not have line adjust or plug in cables. 10"x9"x3½", 10 lbs. **\$74.50**

39G14 Variable G2 conversion kit for CR125 and CR128 CRT checkers\$9.95



CR128A

RC121 Component Substitutor — Substitutes 81 individually isolated component values for test purposes. Substitution range: Carbon Resistors (12-1 watt 10 to 5600 ohms, 12 ½ W 10 K to 5.6 megohms); Capacitors (10-600 volt 100 MMFD to .5 MFD); Electrolytics (10 dual 2 MFD to 250 MFD at 450 V DC, used singly or paralleled to form up to 25 separate values) with exclusive surge protector circuit to prevent arc, spark or heating of condenser in set; Power Resistors (20 wire wound, 20 watts from 2.5 to 15,000 ohms), and Rectifiers (Universal Selenium .5 amps, 800 PIV; Universal Silicon, .5 amps, 800 PIV). 6"x10"x3½", with 4 test leads, 5 pounds **\$39.95**
RC 121 K (Kit) \$27.95

H36 The "Handy 36" — Provides the 36 most often needed resistors and capacitors for experimenting, substituting and testing — 24 Resistors from 10 ohms to 5.6 megohms, 10 Capacitors from 100 MMFD to .5 MFD, 2 Electrolytics 10 MFD and 40 MFD at 450 Volts. 4"x5"x2", 2 lbs. **\$12.75**

ES132 Electrosab — Substitutes electrolytics in a jiffy with full protection for you and the circuit. Provides 10 dual electrolytics from 2 MFD to 250 MFD at 450 VDC or up to 25 single values when paralleled. Surge protector prevents arcing, sparking or accidentally heating capacitors. 3½"x5½"x3", 2 lbs. **\$15.95**



RC121

H36

ES132

STANDARD RCA TYPE COLOR TV PATTERNS AT YOUR FINGERTIPS

NEW
All
Transistorized



CG135



CG126

HERE ARE THE PATTERNS PRODUCED BY THESE EASY TO USE GENERATORS.

14 thin horizontal lines for vertical dynamic convergence. (Only 6 are generated on some generators).

Stabilized crosshatch pattern for simplifying convergence adjustments.

Here are three generators that will help you cash in on the booming color TV business. Sencore offers you a choice; a standard color generator, a deluxe solid state generator and analyzer or a complete TV analyzer for color or B & W. Choose now from one of these three industry leaders . . . they are recommended by every color TV manufacturer.*



Ten standard keyed color bars (RCA type) as shown on all Color TV schematics.



10 thin white vertical lines for horizontal dynamic convergence adjustments.



Stable white dots with exclusive dot size adjustment.



CA122



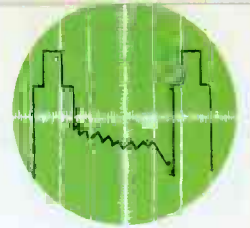
CG126 Standard Color Generator — Produces all the patterns that you need for installing color TV, converging or trouble shooting. Merely connect to antenna terminals and tune receiver to channel 4. CG126 can be retuned to channel 3 or 5 if desired. Then, dial any of the patterns shown above and watch them pop on the screen. Reserve output of up to 200 percent of normal available on color output control to force signal through defective circuits. Adjustable dot size on rear panel and counting circuits that can be retimed right on the TV set are exclusive Sencore features. Wt. 10 lbs. Measures only 9"x11"x6". A real buy at **\$109.95**

All New! CG135 Deluxe Transistorized Color Generator and Analyzer — The ultimate in portability, stability and versatility. All solid state, insuring instant signals with no warm up time. Six jump out proof "Unijunction" counters guarantee solid patterns at all times . . . below zero and up to 140° F. Patterns and operation are same as CG126 (tube model). Unmodulated video (2 V PP plus or minus) for color circuit isolation and sync pulses (for the Zenith receivers) are a real analyzing plus. Quality mirror in removable cover for CRT Convergence. Color gun interruptors with switches on the front panel are guaranteed not to load the circuit. Uses 115 V AC — no messy batteries. **\$149.95**

CA122 Color Circuit Analyzer. For Color or B & W — Produces the patterns shown above plus shading bars for setting TV color temperature controls. Comprehensive analyzing features on the CA122 places it in a class by itself. Variable RF output ch 2-6, for greater flexibility, 20MC to 50MC variable IF output . . . for tuner substitution or injection directly into any IF stage, quickly locates IF stage with low gain. Unmodulated Video, Chroma, and horizontal and vertical sync pulses (all 30 V PP variable positive and negative) isolate trouble in color circuits, video amplifiers, sync circuits or in the color tube circuit in a jiffy. 4.5 mc crystal output insures accurate fine tuning and is used to trouble shoot Audio IF circuits . . . 900 cycle audio for injection at any stage up to the speaker. Color gun interruptors, with special adaptor for new 25" RCA and rectangular Motorola tubes is the greatest time saver of them all. **\$187.50**
10"x14"x8", 15 lbs. Only \$4.95
Adaptor for all rectangular color CRTs (part #39G12) \$4.95

*525 line system only

HIGH SENSITIVITY - WIDE BAND OSCILLOSCOPES



Exclusive Direct Reading Peak-to-Peak Voltage Measurements . . . No Confusing Band Switching!



PS127

Choose from two Sencore professional Wide-Band Oscilloscopes. Exclusive direct reading peak-to-peak volts and high sensitivity on wide band, places these scopes in a class by themselves. Portable, smartly-styled oscilloscopes equip you for every servicing job, and are ideal for field engineering and production line testing. Compare to other scopes costing much more for comparable features and performance.



PS120



39G3 DEMODULATOR PROBE:

for PS127 or PS120 \$5.75



BE113 DUAL TV BIAS SUPPLY—Save time in AGC trouble shooting and TV alignment. A single or two separate 0 to 20 volts DC bias supplies — without interaction. Provides all recommended TV alignment biases. Well filtered; effectively pure DC with less than 1/10th of 1% ripple — calibration accuracy better than equivalent battery tolerance.
4"x2"x2", 1 pound **\$12.75**

PS127 Deluxe 5-Inch-Wide Band Oscilloscope — Tops in performance, operational simplicity and appearance. Vertical amplifier frequency response flat within 1 DB from 10 CPS to 4.5 MC and only 3 DB down at 6.2 MC insures true waveform reproduction. Vertical amplifier sensitivity of .017 volts RMS for one-inch deflection on wide band (without band switching). High input impedance of 2.7 megohms shunted by 99 MMFD (or 27 megohms with 9 MMFD with built-in low capacity probe) insures minimum circuit loading. Now for the first time, view waveforms in TV horizontal and vertical output circuits with built-in low capacity probe up to 5000 volts peak-to-peak. Vertical amplifier attenuator controls calibrated in peak-to-peak volts. Merely set waveform to one inch height and read directly. Horizontal amplifier sweep range from 5 to 500 KC in five overlapping steps and horizontal frequency response from 10 CPS to 1 MC within 3 DB guarantee linear sweep and positive sync. External inputs for horizontal sweep and sync on front panel. Provisions for intensity modulation, and direct connection to deflection plates on rear. 12"x9"x15½", 25 pounds **\$169.50**

PS120 Professional 3-Inch Wide-Band Oscilloscope — New, simplified design — as portable and easy to use as a voltmeter. Vertical amplifier frequency response from 20 cycles to 4 MC flat; only 3 DB down at 7.5 MC and usable to 12 MC. Vertical amplifier sensitivity of .035 volts RMS for one inch deflection saves band switching and guessing. Horizontal sweep frequency range of 15 cycles to 150 KC and sync range from 15 cycles to 8 MC (usable to 12 MC) positively "locks" on all signals. Dual controls simplify tuning. Compartment conceals leads, secondary controls and jacks. With low capacity probe — lowest priced broad-band scope at **\$124.50**

PS120K (Kit) without low capacity probe \$74.50
39G2 LOW CAPACITY PROBE for PS120K \$ 4.95



FM STEREO SERVICE AND CIRCUIT ANALYZERS

Just like having your own FM Stereo Transmitter in your shop

MX 129 FM Stereo Multiplex Generator and Analyzer — A completely transistorized FM Stereo generator that provides all signals generated from the FM transmitter. Here is a lightweight portable unit for your shop or home service that stabilizes in less than a second and is all crystal controlled to maintain stability. It's an analyzer too; operating controls offer the user full control over the left and right signals, pilot signal and modulating signals. Stereo signals are formed from internal 1000 or 60 cycles or from external generator, mike or phono pickup. Exclusive built-in meter, calibrated in DB and PP volts, is used to balance the left and right signals to insure the utmost in signal balance; also used as an external meter to connect across the speakers for channel separation checks. Channel separation and adjustment (if necessary) can be made without pulling chassis by injecting FM signal at antenna terminals. RF is pre-set at 100 mc at factory but can be adjusted to any point on the FM band from front of unit. Unmodulated stereo available at composite output jack for injection at the stereo adaptor for trouble shooting or as a check on RF and IF alignment. 67 KC subscription signal provided on carrier or unmodulated for trap alignment. DB separation of left and right channels exceeds highest quality FM stereo receiver on the market.

10"x9"x3½", 9 pounds **\$169.50**



MX 129



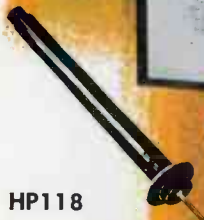
SS137

SS137 Sweep Circuit Analyzer — Simplifies Sweep Circuit trouble shooting in Color or B & W. Uses positive, tried and proven signal injection and component substitution to find the tough sweep circuit problems. All tests dynamic, in circuit, with the TV set on. Checks all sweep circuits: Horizontal oscillator, output, flyback, deflection yoke, 2nd anode and focus voltages and sync circuits; Vertical oscillator, output and deflection yoke. External checks: DC volts, AC volts peak to peak (eliminates using a VTVM at the same time), and 2nd anode voltages of 10 and 30 KV with special built-in probe. With mirror in detachable hinged cover in all steel case. 10"x9"x3½", 10 lbs. **\$79.50**



SM112A

SM112A New Improved Service Master—Before the SM112, you had to cope with using both a VTVM and a VOM. Now, in one instrument, you get a conventional VTVM operating from 115 volts AC for bench or lab work, then, flip the switch to VOM and two batteries power the unit as a 5,000 ohms per volt meter. Make voltage, resistance and current measurements anywhere, anytime. VTVM scales automatically indicated by lighted arrows. Technical data conveniently shown in cover. Single permanent probe for all tests VTVM or VOM. High voltage probe attaches for measuring up to 30,000 volts DC. Input impedance: 11 megohms VTVM • 6 AC and DC voltage ranges 0 to 1000 volts VTVM or VOM • 6 resistance ranges 0 to 1000 megohms VTVM, 2 ranges VOM. 0-1000 MA on VOM. Two percent, six-inch meter covers all measurements. Zero center scale and peak to peak measurements 8"x8"x3½", 7 pounds **\$79.95**



HP118

High Voltage probe, HP118 **\$7.95**

TRANSISTOR TESTING DEVICES



TR115 Transistor-Diode Checker — Tests transistors for leakage, gain, opens and shorts—good, bad or directly in beta; checks diodes for forward to reverse ratio. Tests them all, smallest hearing aid transistors to auto radio power types. Lists Japanese equivalents. Simply operated, proven checker can be used with or without set-up chart for service, experiment or lab work. 5" x 4½" x 2½", 2 lbs. **\$24.95**
Kit..... \$15.95



BE124 Battery Eliminator — Power supply replaces batteries during transistor radio repair. Tapped voltages at 1.5 volt DC intervals from 0 to 12 volts on front panel, connects simply for center tap and bias voltage as required. Function switch converts meter to trouble-shooting 0 to 50 Ma current reading device to monitor transistor radio current drain. Charges nickel-cadmium batteries. Guaranteed accurate. 5" x 4½" x 2½", 3 lbs. **\$24.95**



HG104 Harmonic Generator — Finds defective transistor radio stage in seconds — just touch output leads to inputs and outputs of transistors from speaker to antenna and a clear 1000 cycle note from speaker indicates if stage is good. Two leads and calibrated output (not found on pencils) provided to prevent RF spray on front-end checks. Complete with batteries. 3½" x 4½" x 2" 1 pound **\$9.95**



TR110(A) — New Improved Transistor Master! An out-of-circuit transistor tester just like TR115, a harmonic generator like HG104, that switches into an audio generator, plus a power oscillator type in-circuit transistor checker. This is the famous TR110 transistor radio analyzer that is as effective for locating trouble in new all-transistorized TV sets. Meter also used for voltage and current checks with special leads to prevent breaking circuit. 9" x 8" x 2¼", 2 lbs. ... **\$59.50**

THE SENCORE ACCESSORIES



VB2 Vibra-dapter — Checks 3 and 4 prong Vibrators faster and easier. Plugs into any tube tester, like TC-130 or TC131 Mighty Mite Checkers. To check 6v vibrators set tube tester to test 6AX4 or 6SN7; for 12v vibrators set tester to 12AX4 or 12SN7. Two No. 51 lamps indicate need for vibrator replacement ... **\$2.75**



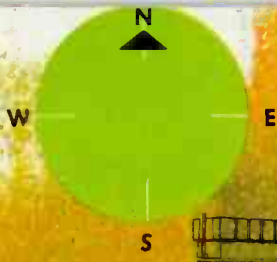
TM116 Modernizing Tube Tester Panel — Adapt your tube checker to test the new tubes — Compactrons, Novars, Nuvistors, 10-pins (except cardomatic types)—by plugging the TM116 into an octal socket of your tester. Works on any tube tester except card-o-matics. Tube set-up chart included with each modernizing panel **\$24.95**



FC123 Filament Checker — Check continuity of all tube filaments including the new Compactrons, Novars, 10-pins and Nuvistors. Test leads for CRT filament checking. Also, doubles as neon voltage indicator. TV cheater cord is used to power unit as a check on the cord to insure 115 volts AC on TV. 4" x 3" x 1". 1 pound **\$3.95**



HM119 "Handyman" — The "Handyman" is an all-in-one unit to save valuable service time — Cheater Cord with on-off switch, Dual Extension Cord, updated Filament Checker, Universal Fuse Checker, handy Trouble Light, Neon Voltage and Continuity Checker, Pin Straightener and Cord Wrapper — all in a single compact unit. Pays for itself in time saved on only a few service calls. 5" x 3½" x 1", 1 pound .. **\$9.95**



FIELD STRENGTH METER

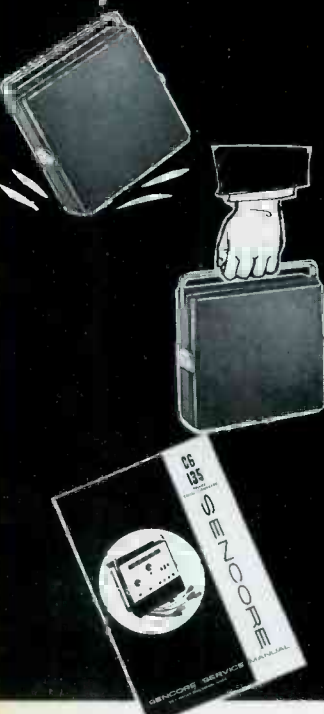


Get in on the lucrative business in distribution systems, UHF, FM, and VHF antenna jobs with the all new FS134 completely solid state portable field strength meter. Calibrated in true microvolts on all bands: $\pm 3\text{DB}$ on VHF-FM / $\pm 6\text{DB}$ on UHF.

FS134 Field Strength Meter — The FS134 uses Jerrold coax connectors so you can correct problems on existing systems, as well as install, balance, and check new distribution systems. Built-in attenuators of 0, 20, and 40 db (X1, 10, and 100) enable you to measure signal strength from the amplifier to last tap-off in the system. The FS134 is portable so you can take it to the top of the tower to orient the VHF TV, UHF TV, and FM antennas for best signal with minimum interaction between them. Highly sensitive: 30 Microvolts $\pm 3\text{DB}$ on VHF-FM and 30 Microvolts $\pm 6\text{DB}$ UHF. Separate built-in UHF tuner for greater accuracy in critical antenna work and translator checking. 4" 2% meter calibrated in microvolts and db. Uses industrial standard for 0 db, often called 0 DBJ or DBM. Now check db loss in various cables and lines, compare different antennas and amplifiers for db gain, field intensity surveys, and show a critical customer why he needs a new antenna for his FM stereo or color TV set. The audio amplifier and speaker let you monitor the TV or FM sound signal and aid in tracking down noise. Besides the Jerrold connector for 75 ohm cable, the FS134 has a built-in balun to match 300 ohm twin-lead; no messy adaptors. The FS134 is powered by easy to get "C" cells or optional rechargeable battery supply (part #39G15), installed in minutes as cheater cord receptacle is already riveted to panel. 10"x9"x5", 9 lbs. . . . **\$199.50**

39G15 Rechargeable battery supply (less battery). **\$9.95**

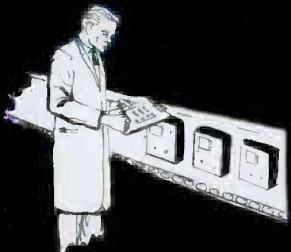
QUALITY FEATURES OF YOUR SENCORE EQUIPMENT



STRENGTH OF CASE — Sencore instruments are encased in steel of adequate gauge to insure rugged service and long life. In the shop, in the truck or in the field, Sencore instruments are built to give you reliable service longer!

CONVENIENT SIZE — Size, weight, and compactness are major considerations at Sencore in the design of every instrument. Along with famous Sencore quality, you are always assured of the maximum handling convenience attainable for each instrument by modern designing skill.

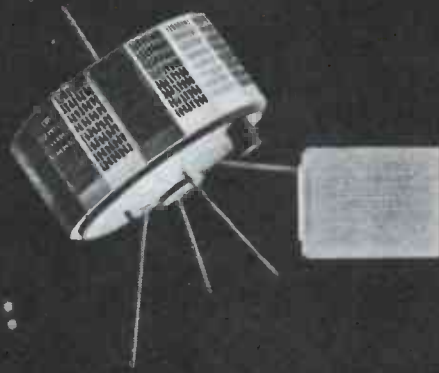
INSTRUCTION MANUALS — Clearly written, detailed operating instructions are included with every Sencore instrument, along with complete Circuit Schematics Trouble Shooting Charts and Parts List. Tube and transistor set-up charts are automatically mailed to you from the factory by merely signing the warranty card.



QUALITY ASSURANCE — Assured Quality has made American-produced Sencore instruments the first choice of professional servicemen. At Sencore, every unit is twice inspected for overall quality, then subjected to an extreme, continuous 24-hour performance reliability test, followed by rigorous tests for stability and proper function in extremes of cold and heat.

GUARANTEE — Sencore products are guaranteed to be free from defects due to workmanship when purchased. Except for misuse, abuse, or damage through mishandling, any unit found defective within 90 days and returned to the factory service department will be repaired without charge, provided the Warranty Card has been returned within 10 days of purchase.

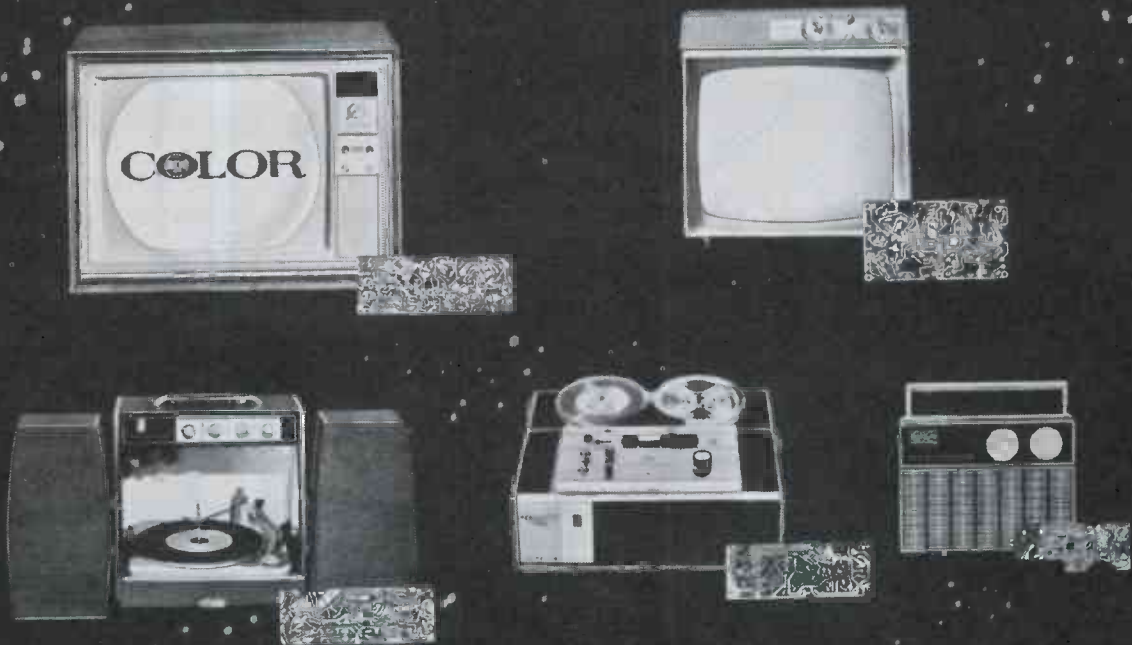
A modest service charge is made for parts and/or labor in all other cases.



Tiros uses Solid RCA Circuits

The entire RCA Victor line
uses RCA Solid Copper Circuits
Why?

RCA Solid Copper Circuits won't come loose.
Won't short circuit. Won't go haywire. They're the
Space Age advance over old-fashioned "hand wiring."



SHOWN AT TOP: SOLID RCA CIRCUIT DESIGNED FOR NASA'S TIROS

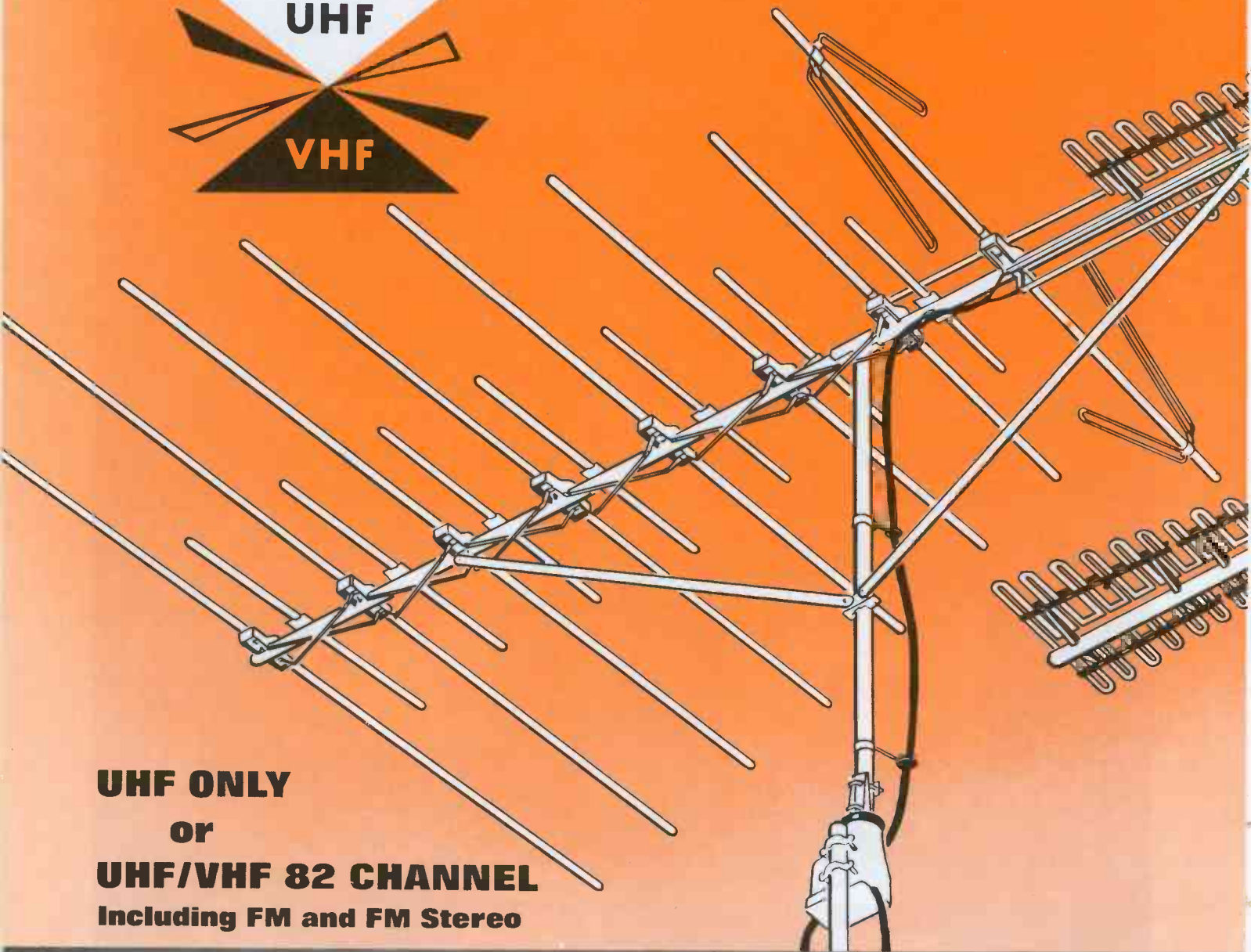


The Most Trusted Name in Electronics

TM&© 1966

The first completely new antenna concept in years...

Revolutionary **CHANNEL** **ULTRADYNE SERIES**

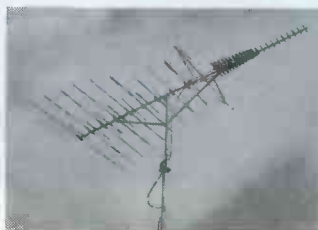


UHF ONLY
or
UHF/VHF 82 CHANNEL
Including FM and FM Stereo

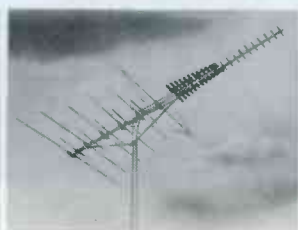
Model 0032 U-V Band Splitter included with all 82 channel antennas.

BREAKTHROUGH!

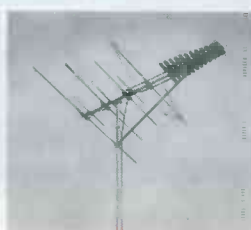
Five new ULTRADYNE CROSS-FIRE antenna models provide the first high gain FM and FM Stereo performance ever attained in an 82 channel TV antenna. Channel Master's exclusive, patented Tri-Band Directors make it possible. All ULTRADYNE series antennas feature the famous EPC golden coating.



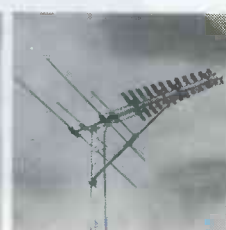
Model 3632G
for deep fringe areas



Model 3634G
for near fringe areas

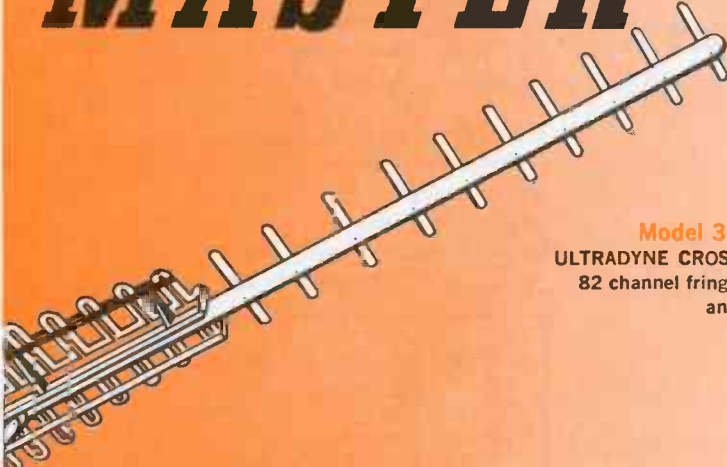


Model 3635G
for suburban areas

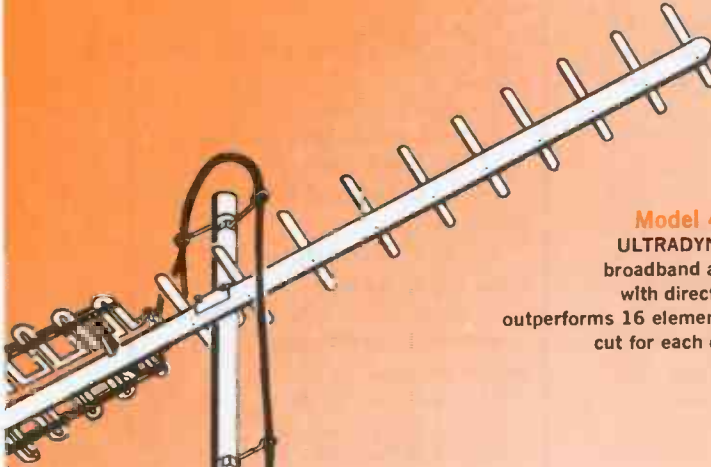


Model 3636G
for metropolitan areas

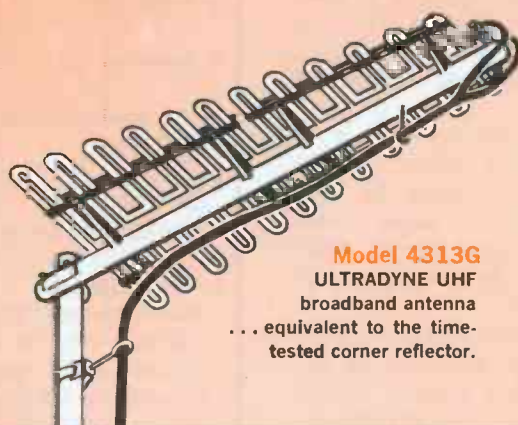
MASTER[®]



Model 3633G
ULTRADYNE CROSSFIRE
82 channel fringe area
antenna.



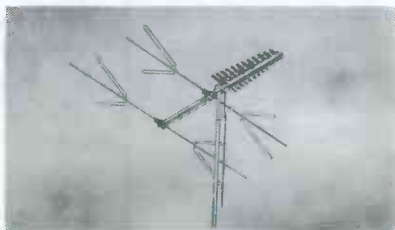
Model 4314G
ULTRADYNE UHF
broadband antenna
with directors . . .
outperforms 16 element Yagis
cut for each channel



Model 4313G
ULTRADYNE UHF
broadband antenna
. . . equivalent to the time-
tested corner reflector.

BREAKTHROUGH!

The amazing electronic ghost-killing power of Channel Master's famous Coloray antenna is now combined with the ULTRADYNE principle to create an 82 channel antenna for superb color reception as well as FM and FM Stereo in ghost-plagued areas.



Model 3637G
ULTRADYNE COLORAY

Circle 18 on literature card

www.americanradiohistory.com

COLOR AGE BREAKTHROUGH!

Model for model, new ULTRADYNE CROSS-FIRES are the highest gain, highest front-to-back ratio 82 channel antennas ever developed. Unprecedented acceptance has made Channel Master Color Crossfires the best-selling VHF-FM antennas in TV history. Now, in combination with the ULTRADYNE UHF antenna, new standards of 82 channel performance are achieved.

BREAKTHROUGH!

Obsoletes so-called log periodic antennas. ULTRADYNE antennas, employing an entirely new principle, have higher gain than any log periodic antenna type on the market.

BREAKTHROUGH!

"Built-In" 300 ohm impedance actually makes the ULTRADYNE function as a length of 300 ohm transmission line at VHF. This eliminates the need for an antenna coupler when the ULTRADYNE is used in conjunction with any 300 ohm VHF antenna such as Channel Master's Famous Color Crossfires (models 3617G, 3610G, 3611G, 3612G, 3613G, 3614G, and 3615G).

BREAKTHROUGH!

Fantastic front-to-back ratios . . . over 15:1 across the entire UHF band.

BREAKTHROUGH!

Unique construction. Two stamped aluminum sections make up the entire driven element section of the antenna. This means precise control of dimensions and the elimination of connection and corrosion problems.

BREAKTHROUGH!

Three separate United States patents and two patents pending cover the exclusive design features of Channel Master's new ULTRADYNE series. No other antenna line incorporates such important technical advances. Yes, from the standpoint of gain, front-to-back ratio, impedance, construction simplicity and versatility, no other antenna comes close to the ULTRADYNE series. No wonder the entire industry knows that the truly significant advances in antenna design traditionally come from . . .

CHANNEL MASTER ELLENVILLE, NEW YORK
World's Largest Manufacturer of TV/FM Reception Equipment



Notes on Test Equipment

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

by Arnold E. Cly

Measures Strength of FM, VHF, UHF Signals

As the popularity of FM stereo listening increases, many customers will be asking whether they can expect good FM stereo reception if they purchase such an instrument. Others, who already are stereo listeners, will be asking if their reception could be better. The only way to answer these questions accurately is to measure the RF signal strength provided by an antenna system at a given location. The same holds true for VHF and UHF television reception. The SENCORE Model FS134 field-strength meter (Fig. 1), an all-solid-state instrument, permits these measurements to be made.

The first step in measuring an RF signal is to determine the impedance of the line that will couple the signal to the FS134 input; this could be 15 or 300 ohms. Signals coupled to the 300-ohm INPUT terminals are fed to a matching transformer, which then applies the signals to the $\times 1$, $\times 10$, or $\times 100$ input jacks via a 75-ohm coaxial cable. The $\times 1$ input couples a signal

directly to the tuner; the $\times 10$ input attenuates the signal to one-tenth of its original level (20 db loss), and the $\times 100$ input affords an attenuation to one-hundredth of the original level (40 db loss).

The received signal is fed to either the VHF or UHF tuner, depending on the type of signal measured (FM, VHF, or UHF), through appropriate filters. The low-band VHF frequencies (channels 2 through 6 and the 88-108 mc FM band) are coupled through a low-pass filter; channels 7 through 13 are fed through a high-pass filter. UHF signals are applied directly to the UHF tuner.

The output of both tuners is at 42.8 mc. A three-stage IF strip is used. When the selector knob is set to receive low-band VHF frequencies, a 42.8-mc trap is switched into the RF input circuit.

With the selector switch set to UHF, the 42.8-mc output of the UHF tuner passes through the VHF RF amplifier and mixer stages as well as the three IF stages; thus the UHF signal is fed through five stages of IF amplification.

The output of the IF strip is applied to a detector stage consisting of two 1N24 diodes. These form a doubler circuit that develops a positive DC voltage two times the average RF level. The demodulated signal is fed to an audio amplifier whose output is coupled through a volume control to another audio amplifier. (The demodulated signal also couples directly from the output of the diode detector circuit through a 47K resistor to a DET OUT jack mounted on the front panel. This jack permits the monitoring of a detected signal with an oscilloscope or external meter.) The output of the

second amplifier receives additional gain as it passes through the driver and push-pull output circuits.

The voltage that appears at the emitter of the first audio amplifier has a DC level proportional to the RF carrier level. This voltage is coupled through a divider network to the base of an AGC amplifier transistor (NPN). As this voltage goes more positive, the forward bias of the transistor increases. This causes a collector-current increase and a resultant DC voltage decrease. The collector voltage is DC coupled to the base of

SENCORE Model FS134 Specifications

Frequency Coverage:

53 to 109 mc—Channels 2 to 6 and FM radio band.

173 to 218 mc—Channels 7 to 13.

465 to 895 mc—Channels 14 to 83.

Sensitivity:

53 to 109 mc, 30 uv ± 3 db.

173 to 218 mc, 30 uv ± 3 db.

465 to 895 mc, 30 uv ± 3 db.

Selectivity:

500 kc @ 3-db points

Input Impedance:

75 ohms-300 ohms with built-in matching transformer.

Image Rejection:

53 to 109 mc, 40 db

173 to 218 mc, 40 db

465 to 895 mc, 30 db

IF Frequency:

42.8 mc

IF Rejection:

40 db

Audio Power Output:

150 mw

Meter:

2" x 4"

500-ua movement. Two scales:

30 to 30,000 uv, -30 to +20 db.

Power Required:

Self-contained supply consisting of nine 1½-volt size-"C" cells: 8 used as B+ source, 24 ma @ 12-volts on VHF (no signal) and 35 ma @ 12-volts on UHF (no signal); 1 used as bias source, 2 ma @ -1.5 volt. An accessory battery charger can be used with a rechargeable battery.

Size: (HWD)

9½" x 10" x 5"

Weight:

9 lb.

Price:

\$199.50

Charger \$9.95



Fig. 3. Solid-state circuits throughout.

Free Photofact® Annual Index

for your use
throughout 1966



send today for your instant handy guide to the world's finest electronic service data!

covers over 65,000 listings of:

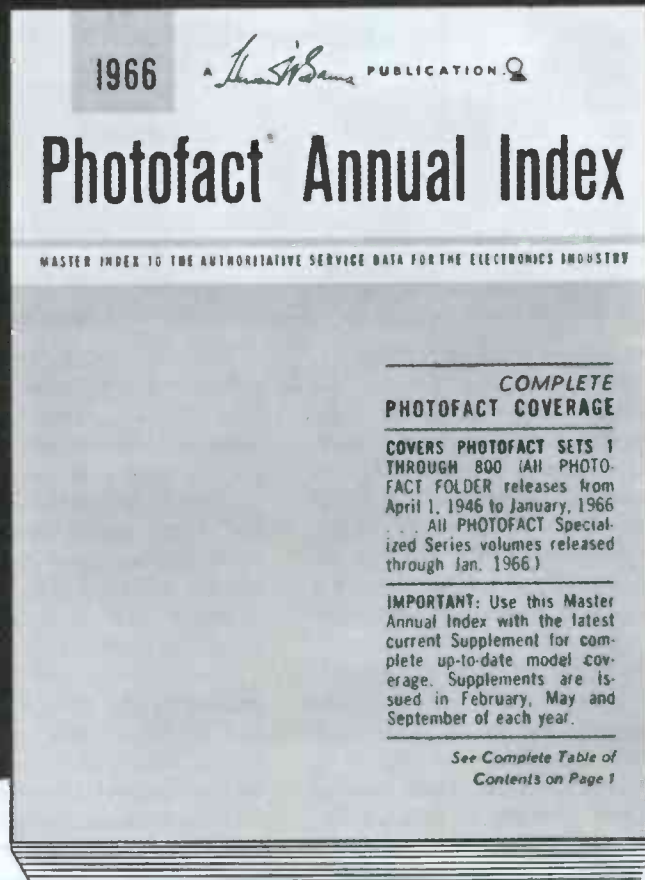
TV Receivers • Home & Auto Radios • Phonos & Hi-Fi
CB Radios • Tape Recorders • Record Changers

NOW INCLUDES—

- Special Index to Color TV Receivers
- Complete Listing of Sams Technical Books
- Complete List of Sams Distributors

Send today for this valuable 128-page guide covering virtually every model of home-entertainment electronic equipment produced since 1946! Helps you locate the proper PHOTOFACT Folder to quickly solve any service problem in any model. PHOTOFACT provides *everything* you need in complete, uniform style for quick, effective repairs: Famous Standard Notation Schematics packed with the service details you need; Full Photo Coverage of all chassis views; Complete Replacement Parts Lists; Tube Placement Diagrams; Alignment Instructions; CircuiTrace® for printed boards; Disassembly Instructions; Dial Cord Diagrams; Changer and Recorder "Exploded Views"—plus dozens of other great features. Send coupon for your FREE copy of the latest PHOTOFACT Index to the service data you need!

FREE! Famous 14-volume NEW STANDARD ENCYCLOPEDIA—the supreme gift for your family—FREE with your purchase of a PHOTOFACT Library! This invaluable Treasury of Knowledge for all the family sells at retail for \$149.50—now yours FREE with the purchase of 225 PHOTOFACT Sets or more. See your Sams Distributor for the exciting details, or send coupon today!



**NEW "PHOTOFACT ANNUAL INDEX" AND
3 SUPPLEMENTS NOW PROVIDE COMPLETE
REFERENCE TO PHOTOFACT COVERAGE:**

Send for the Photofact Annual Index—your "master" reference throughout 1966. Once you are on our mailing list, you will automatically receive three additional Index Supplements (in February, May, and September, 1966) to keep you up-to-the-minute on Photofact coverage of the latest equipment released.



**HOWARD W. SAMS & CO., Dept. PFF-1
4300 W. 62nd St., Indianapolis, Indiana 46206**

- Send **FREE 1966 Photofact Annual Index** and place my name on your mailing list to receive the Supplements
- Send full information on **FREE Encyclopedia Offer, Easy-Buy Photofact Library Plan and Standing Order Subscription**
- My Distributor is _____

Shop Name _____

Attn.: _____

Address _____

City _____ Zone _____ State _____

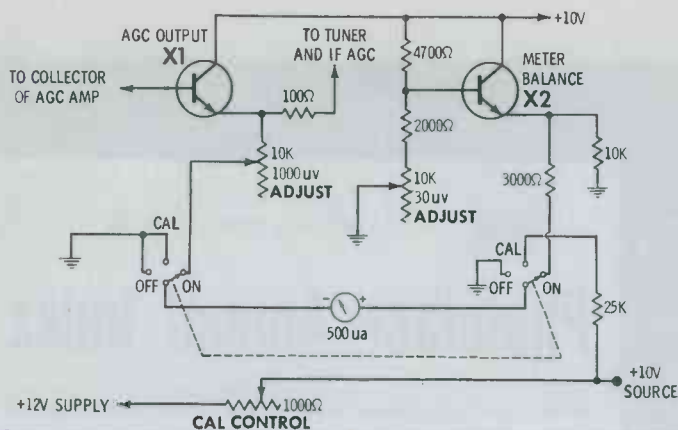


Fig. 2. Emitter circuit voltage on AGC-output transistor operates the meter.

the AGC output transistor (Fig. 2), and as it becomes less positive the AGC emitter voltage is reduced.

As the RF carrier level increases, the AGC voltage is less positive. The AGC voltage is applied to the VHF mixer and first and second IF stages; thus, a less positive AGC voltage reduces the overall gain of the unit. This same voltage is applied to the negative terminal of the meter. Since a voltage decrease occurs as the RF carrier level is increased, a greater potential is placed across the indicating meter, and the needle swings in a positive direction. The meter reading is the signal strength in micro volts.

The CAL control determines the DC source voltage to the tuner, IF, and AGC circuits. The indicating meter measures this voltage when the OFF-CAL-ON switch is moved to the CAL position. The control is adjusted until the meter needle points to the CAL mark on the meter face. Should the needle fail to reach this mark, the batteries are probably weak and should be replaced.

The 1000-uv and 30-uv controls, located in the emitter circuits of X1 and X2 respectively, are internal calibration adjustments for the meter. The service manual explains these adjustment procedures completely.

To measure the strength of an RF signal, the impedance of the antenna lead-in is determined, and the lead-in is then connected to the correct input terminals of the FS134. The selector switch is moved to the appropriate frequency band. Assume you are checking the RF signal strength on Channel 6. The bandswitch is set to the CHAN 2-6-FM position. Move the OFF-CAL-ON switch to CAL, and adjust the CAL control until the meter needle points to CAL on the meter face. Now, move the switch from CAL to ON, and adjust the volume control until noise can be heard from the speaker of the FS134. Rotate the tuning control until the number 6 on the frequency dial appears under the hairline indicator. As the letter P — located to the right of the number 6 on the frequency dial — is approached, a 60-cps buzz is heard from the speaker, and deflection of the meter can be seen. This is an indication of the video carrier frequency of channel 6. Continue to turn the tuning control toward the P until maximum indication on the meter is noted. When this point is reached, Further assume that the connection

MID-STATE TUNER IN '66

ABSOLUTE 24 HR. SERVICE, A NECESSITY AT MID-STATE

UHF **\$9.50**
VHF
COLOR

Absolute 24 hour service is a necessity at Mid-State, regardless of manufacturer. Mutilated and damaged tuners may take slightly longer if major parts are not in present stock. All units tracked and aligned to factory specifications with crystal controlled equipment. 90 day warranty.

Distributors: Write for Price Sheet

Put your confidence in Mid-State to take care of your tuner servicing. Send complete with Model and serial numbers and all damaged parts.

COMBO'S — \$17.50
Major parts, tubes, transistors charged at net price.

MID-STATE TUNER SERVICE

1502 So. College Ave.
P. O. Box 1141 D-1
Bloomington, Indiana, Tel. 336-6003

Circle 20 on literature card

INJECTORALL

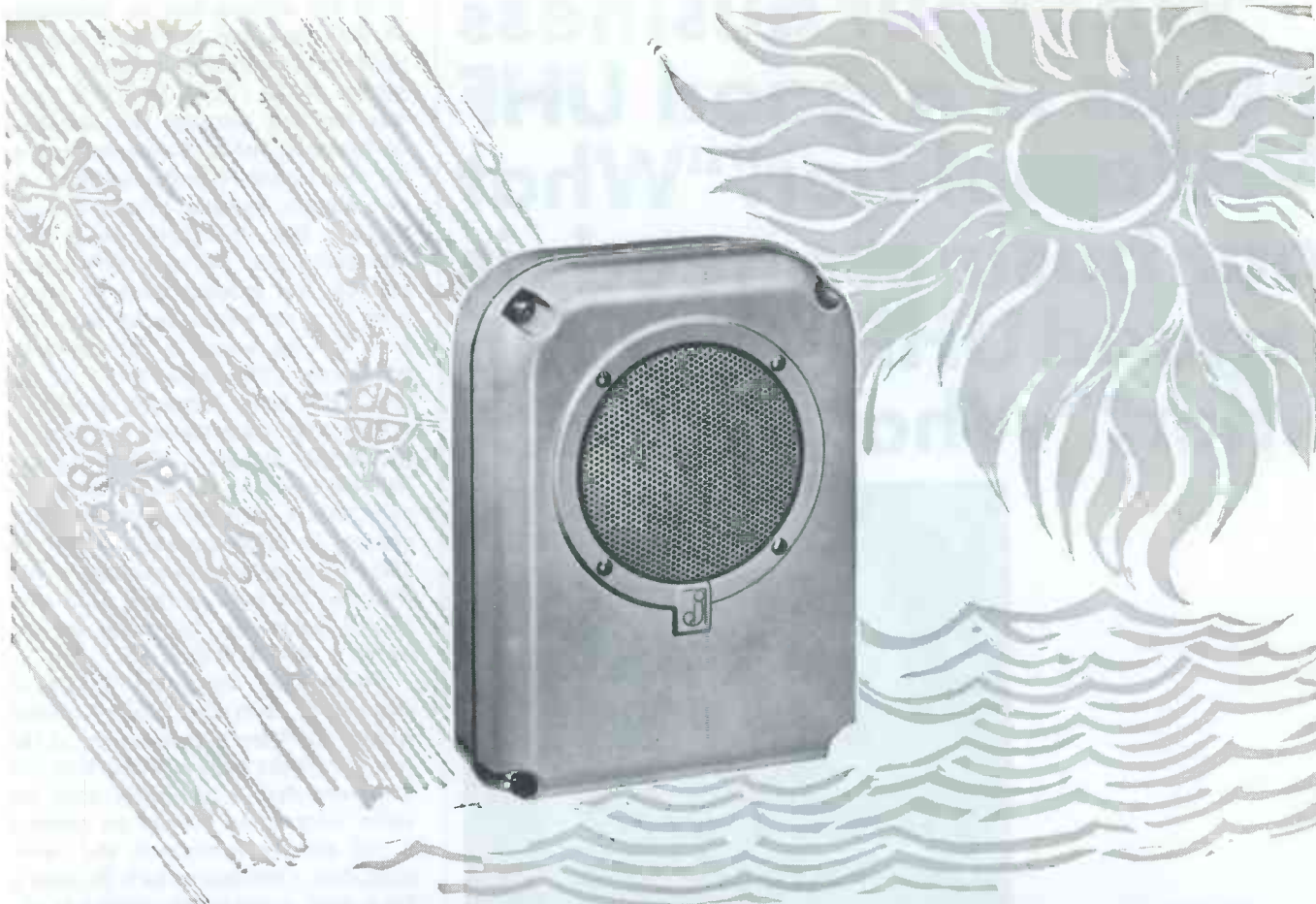


...TIGER of a CLEANER!

InjectoRall's Tuner Cleaner—No. 899WN... is the best cleaner on the market today. It cleans **better**, and **faster** than all other cleaners and ...leaves a wax-free coating that protects and lubricates contacts. Equipped with the **InjectoRall 6 inch steel needle** it reaches hard-to-get-at places in tuners. Ask for... INJECTORALL TUNER CLEANER in the blister-pack.

NO. 899WN
INJECTORALL
ELECTRONICS
CORPORATION... Great Neck, N. Y. 11024
6 oz... \$1.95 net

Circle 22 on literature card



TOTAL EXPOSURE SPEAKERS WITH HI-FI RESPONSE

Install them! Forget them! Jensen's new "Total Exposure" loudspeakers fill the need for public address speaker systems with wide range response and high efficiency. You can now have naturalness of speech and music at very high levels in speakers that ignore the elements. These units will indefinitely withstand the punishment of rain, sandstorms, tropical humidity and fungus, salt spray and industrial corrosive atmosphere; performance characteristics that exceed stringent military specifications.

The Jensen TX Series includes four units—two loudspeakers for installation in walls or existing baffle structures and two loudspeakers encased in "exposure proof" cases for wall or bracket mounting.



MODEL TX-800 8" loudspeaker with fabric-base plastic diaphragm incorporating multiple roll Jensen FLEXAIR® suspension system for low resonant frequency plus high amplitude.



MODEL TXR-800 Consists of the TX-800 loudspeaker unit in a molded fiber glass case. Hinged front cover simplifies installation. Outside dimensions are 14½" high, 13¾" wide and 7¾" deep.



MODEL TX-525 5¼" loudspeaker with durable plastic diaphragm, with exclusive Jensen FLEXAIR® suspension system to provide excellent amplitude capability and low resonant frequency.



MODEL TXR-525 Incorporates the TX-525 loudspeaker unit in a die cast aluminum case; front cover is readily removed for easy installation. Dimensions are 11" high, 8¾" wide and 4" deep.

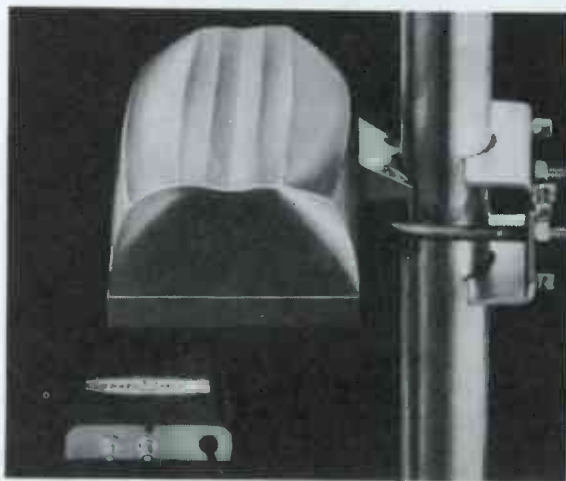


JENSEN MANUFACTURING DIVISION / THE MUTER COMPANY / 6601 SOUTH LARAMIE AVENUE, CHICAGO, ILLINOIS 60638

• Argentina: Ucoa Radio, S.A., Buenos Aires • Mexico: Fapartel, S.A., Naucalpan, Mex.
Circle 21 on literature card

January, 1966/PF REPORTER 63

“What our business needs is a good UHF VHF amplifier.” “What our business needs is a good UHF-VHF amplifier.” “What our bu..”



“Say no more.”

“You mean there’s an amplifier that covers all TV channels from 2 to 83?”

“You bet. In fact there are two—the outdoor U/Vamp-2 and the indoor V/U-ALL2.”

“Suppose I live in an area where there’s only VHF?”

“Your motto should be ‘Be Prepared’ because there are a lot of new UHF stations soon to come on the air. These all-channel amplifiers are obsolescence-proof.”

“Anything I should know about the U/Vamp-2?”

“Well, the U/Vamp-2 is compact and easy to install on the antenna mast. Has a remote AC power supply.”

“How about performance?”

“Two transistors give you all the power you need for better reception on VHF and UHF. Also protect against overload. Lists for \$49.95.”

“Supposing I don’t want to put an amplifier up on my antenna mast?”

“Then use the V/U-ALL2. Not as effective as the U/Vamp-2, but you don’t have to climb a ladder . . . and it delivers signals to two TV sets. Only \$42.50 list.”

“Guess I’ll rush down and get one of the new Blonder-Tongue UHF/VHF amplifiers.”

(This message was paid for out of the gross profits of BLONDER-TONGUE, 9 Alling St., Newark 2, N.J.)

Circle 23 on literature card



from the antenna had an impedance of 300 ohms and the signal was applied to the 300-ohm matching transformer of the FS134. Since the signal was coupled through the matching transformer, the microvolt reading on the meter must be multiplied by 2. As an example, suppose microvolt reading was 200; multiplying by 2 gives 400 microvolts. For a more accurate reading, this product must be multiplied by a conversion factor which allows for the losses in the matching transformer. This factor is 1.1 for the low VHF band (channels 2-6-FM). (Other conversion factors are listed in the service manual.) Multiplying the 400 microvolts by 1.1 gives 440 microvolts; this is the signal strength of the channel 6 video carrier. (When the 300-ohm matching transformer is not used and the input is from a 75-ohm coaxial cable, the indication on the meter is read directly.)

To monitor the audio carrier of channel 6, turn the tuning control toward the letter s that appear at the low side of the channel-6 mark on the frequency dial. You should hear the audio information present on channel 6 and note an increase in the meter indication. Continue to turn the tuning knob until a maximum reading is observed on the microvolt meter. The correct microvolt reading is obtained in the same manner as was the video-carrier reading.

A maximum meter indication will be present with minimum audio output volume when determining the signal strength of an FM or TV-sound signal. This is normal, since slope detection is used in this instrument for frequency modulated signals. However, when the video carrier of a TV signal is tuned for maximum 60-cps buzz from the speaker, the meter will indicate maximum deflection since the video carrier is amplitude modulated.

The 500-ua meter has two scales for determining signal strength. The logarithmic microvolt scale extends from 30 to 30,000 microvolts, and the best meter accuracy is obtained between 30 and 1000 microvolts. If this portion of the scale is used, it may be necessary to use the attenuation provision of the $\times 10$ or $\times 100$ 75-ohm input jacks. Should either of these inputs be used, the microvolt reading must be multiplied by 10 when the $\times 10$ input is used and by 100 when the $\times 100$ input jack is used.

The microvolt scale begins at 30 microvolts. However, fringe-area video signals as low as 5 microvolts can be detected by listening for 60-cps buzz from the speaker. With proper an-

tenna orientation or relocation, the signal may be built up to a level that will be visible on the meter (30 microvolts or more).

The decibel scale on the panel meter is used primarily for measuring the various losses encountered in pads, cables, couplers, etc., found in antenna distribution systems. The zero-db reference is 1000 mv across 75 ohms. Should the $\times 10$ or $\times 100$ attenuator jacks be used with the db scale, 20 db is added to the final db figure for the $\times 10$ jack, and 40 db is added for the $\times 100$ jack.

Field-intensity surveys are easily performed with the FS134 because of its compactness, portability, and self-contained power supply. A straight dipole antenna, cut to the frequency being plotted, and the field-strength meter are all that is needed. A "rabbit-ears" antenna could be mounted on the end of the pole and used as a straight dipole.

Occasionally, FM, VHF, and UHF antennas are mounted on the same mast. An interaction between them usually results; they must be arranged on the mast to minimize this interaction. The FS134 can be used to monitor the signals from the antennas,

and the proper placement of each can be made to provide the best signal reception for each band.

This instrument is useful in setting up a TV distribution system. The signal levels can be checked across the band to determine if all signals are being distributed properly to each TV.

Signal generators can be calibrated by using the frequency dial of the FS134 and comparing its reading with that of the signal generator. The output impedance of the generator must match the input of the FS134. Also, it is important not to overload the field-strength meter with excess signal-generator output.

In our lab, we compared the frequency of several RF signal generators to the FS134. Some were found to be slightly off calibration; however, none of them were off enough to warrant recalibration. Nevertheless, these comparison checks demonstrated the ease and simplicity of checking the calibration of an RF generator using the FS134 as a standard.

We checked the signal strength of several FM and VHF stations in our area. The information from each audio carrier came through loud and clear

from the speaker; also, the correct frequencies of these audio carriers were observed on the frequency dial. The video carriers of the VHF signals were easily located on the frequency dial, and at the same time the 60-cps buzz was heard from the speaker, a maximum indication was noted on the microvolt meter.

A UHF signal was checked with very little difficulty. The station was located approximately 30 miles from the measuring point. However, the monitoring of UHF signals for proper antenna orientation and installation is more critical than with VHF signals. Antenna height—especially above a metal roof, anchoring of the twin lead, antenna orientation due to foliage, etc., all must be considered when dealing with UHF reception.

Complete operation of the FS134 is fully explained in the comprehensive service manual supplied with each instrument. Thorough alignment and calibration instructions are given should these procedures be required. Also included is a troubleshooting chart pointing out some corrective measures to be employed if trouble is experienced with the instrument. ▲

ANTENNACRAFT



**DURA-GOLD
VINYL FINISH**

Here is an impressive, full sized, all-band (UHF-VHF-FM) antenna that assures your customers of getting full value for their antenna dollar. Built with Antennacraft's famous automatic hardware and rugged construction, this light weight (4½ lbs.) full size antenna takes less time and effort to install than comparable antennas of any other brand.

Compare the Model 604 with any other antenna, for size, cost, or performance, you will know then that there is no half-way measure with Antennacraft full size, full value, better performing antennas.

The Model 604 lists for only \$24.95. Other Models are available from \$17.95 to \$59.95 list.

Model 604

TOTAL TELEVISION UHF VHF FM

- Delivers Consistently Better Color or Black and White Pictures and Full Range FM Sound.
- Makes all Channels in your area available with one antenna...one lead-in.



BETTER BUILT FOR BETTER PERFORMANCE
ANTENNACRAFT
Automatic Channel Selector
TV ANTENNAS
BURLINGTON, IOWA

Chuck Gravina just learned how to plan his profits the easy way.

It wasn't hard at all. Chuck took advantage of the all-new expanded Philco Tech-Data & Business Management Service. He received all the facts in the mail, liked what he read, subscribed and received Philco's Profit Planning kit *free*.

The kit contains a 24-page guide on profit planning, plus an accurate, easy-to-use profit calculator. Philco designed it especially for service-businessmen like you. You get practical, usable information that can help *you* make *your* business more profitable.

And Chuck's subscription means a wealth of factory-accurate new product manuals — mailed directly to him. So you'll know about the new products *before* they reach the retailers. You'll get monthly information on business management and customer relations. And, of course, you'll receive a full year's subscription to your Philco Service Businessman's magazine.

Chuck Gravina knew a good program when he saw it. And he subscribed. How about you? Shouldn't you subscribe right now and start planning your own profits for 1966? Philco is mailing all the details to thousands of service-businessmen right now. Watch your mail for all the information. And if you'd like any additional facts, talk to your Philco Distributor or contact Parts & Service Department, Philco Corporation, Tioga & "C" Streets, Philadelphia, Pa. 19134.

PHILCO
A SUBSIDIARY OF Ford Motor Company



Circle 25 on literature card

Small Record Player

(Continued from page 34)

Needles are subject to physical damage as well as normal wear. They should be checked and replaced if necessary. In a particular portable unit, the audio had a scratching noise. The noise would vary at different parts of the record. Even though the needle was rather new and had little playing time, it was suspected as the source of trouble. Observing the needle under a magnifier revealed the point was chipped. The needle was replaced, and the scratching noise in the audio was cured.

No Volume

Absence of both hum and signal indicates insufficient voltage from the rectifier section. Measure the voltage across one of the B+ filter capacitors. If no voltage is present there, test the rectifier. Check the fusible resistor (R1 in Fig. 3) with an ohmmeter; these resistors open if a short appears along the B+ line.

If you detect the odor of rotten eggs, you can be assured the selenium rectifier is shorted. The rectifier may have been defective and shorted itself, or a short could have developed on the B+ line. It is important to determine the location of the short before a new selenium rectifier is installed.

A selenium or silicon rectifier has a certain front-to-back resistance ratio; a silicon unit has a larger ratio than does a selenium unit. The condition of either rectifier can be determined by comparing the forward and reverse resistances with an ohmmeter. Should both resistance measurements be nearly the same, the rectifier is defective and must be replaced.

A loud 60-cps hum from the speaker of a phono indicates an open B+ filter capacitor. The volume control has no effect in quieting this hum. Also, a shorted amplifier tube can cause a certain amount of hum.

Conclusion

Don't dismiss the small record player as a nuisance. Servicing these units can put dollars in your pocket, and the customers who bring them in may bring you even more business in the future. ▲

Made for EACH OTHER...

Color Television Production Up 80% in Six-Month Period

June Output
Production of
Radio Sales Up

record; Half Year
is 1,063,093 Units;
figures Reveal

WASHINGTON, D. C.
Production of color televi-

**THE BEST
TUNER CLEANER
FOR
COLOR SETS**

monthly production
205,677 units establish
of this year.
June output was up
above the June, 1964
725 units and 36.8 per-



**THE
ONLY
TV TUNER CLEANER
GUARANTEED
NOT TO DETUNE
COLOR SETS**

(Continued on Page 10)

NOW AT ALL
DISTRIBUTORS
\$2.99
DEALER NET

CHEMTRONICS
1260 RALPH AVENUE
BROOKLYN, NEW YORK 11236

Circle 26 on literature card

PRECISION ALL-PURPOSE SIGNAL TRACER



For fast servicing of AM, FM, TV,
Audio and Electronic Equipment . . .

Checks all stages from antenna to speaker or picture tube. Tests microphones, appliances, pickups, transformers, speakers, resistors, condensers, etc. Quickly locates intermittents, open circuits, hum, noise, distorted stages. Both visual and aural tracing with super-sensitive indicator eye and built-in 5" speaker. 3 stage preamplifier circuit plus overall feedback. Wide band response, additional voltage gain of 400 for scope or VTVM. 110-120 volts AC at 60 cycles. Wt. 9½ lbs.

Model 202. Signal Tracer with AF Probe. . . . \$9.95
Model B Probe. RF Demodulator Amplifier Probe with amplifier-detector tube for high gain and frequency responses to 300 MC. 7.50



See your distributor or write Dept. PF-1
PRECISION ELECTRONICS, INC.
9101 King Street, Franklin Park, Illinois

Circle 27 on literature card

Whether on land, sea or air, your radio communications will be more dependable with TEXAS CRYSTALS . . . made with the same precision, care and quality as those supplied to numerous space projects. And, you'll appreciate the attractive prices. Send for descriptive catalog today.

If your dealer can't supply your TEXAS CRYSTALS needs, send his name with your order to our plant nearest you.



**TEXAS
CRYSTALS**

A Division of Whitehall Electronics Corp.

1000 Crystal Drive 4117 W. Jefferson Blvd.
Fort Myers, Florida Los Angeles, California
Phone 813 WE 6-2109 Phone 213 731-2258

Circle 28 on literature card

GREATER SELLING POWER:
SEE YOUR ELECTRONICS PARTS DISTRIBUTOR:

Weller® for every soldering job

Pencil Soldering Irons by Weller



"Marksman" Kit with pencil soldering iron; screwdriver, cone and chisel tips; handy soldering aid and a supply of solder. \$444 list Model SP-23K.



"Marksman" Iron at popular price. Stainless-steel long-reach barrel. 1/8" replaceable tip. Maximum tip temperature, 750°F. \$298 list Model SP-23.



Weller Iron is industrial rated, highly efficient. Does work of bigger irons. Only 7 7/8" long including the tip. 25 watts. 115 volts. \$520 list Model WP-S.

Temperature Controlled Soldering Unit

For universal hobby soldering, including heavy-duty metal work. Temperature control is in the tip. Interchangeable tips give a choice of 500°F, 600°F, 700°F and 800°F controlled temperatures. Operates on 24 volts. Complete with 3/16" 700°F tip and 60 watt, 120 volt, 50/60 cycle power unit with soldering pencil stand and tip cleaning sponge attached. Model W-TCP, \$2600 list



Dual Heat Soldering Guns

100/140 Watts. Two trigger positions let you switch instantly to high or low heat to suit the job. Tip heats instantly and spotlight comes on when trigger is pulled. Tip has exceptionally long reach. Model 8200. \$695 list

145/210 Watts. A professional model with all Weller gun features: instant heat, \$995 list dual heat, spotlights. Model D-440.

240/325 Watts. Heavy-duty model with all Weller gun features: instant heat, \$1095 list dual heat, spotlights. Model D-550.



Dual Heat Soldering Gun Kit

Includes Weller 100/140 watt dual heat gun, 3 soldering tips, tip-changing wrench, soldering aid, flux brush, supply of solder . . . all in a colorful utility case of break-proof plastic. Model 8200PK. \$895 list



Heavy-Duty Soldering Gun Kit

Features Weller 240/325 watt dual heat gun; tips for soldering, cutting and smoothing; tip-changing wrench; solder; metal-tone utility case of break-proof plastic. Model D-550PK. \$1295 list



Utility Grade Solder On Hang Cards 5 feet of 40/60 alloy solder in each pack. Acid core, AC-40. Rosin core, RC-40. 39¢ list



Superior Grade Solder in Dispenser Tubes 10 feet of 60/40 alloy rosin-core solder in each tube. Number RC-60. 59¢ list

(Continued from page 41)

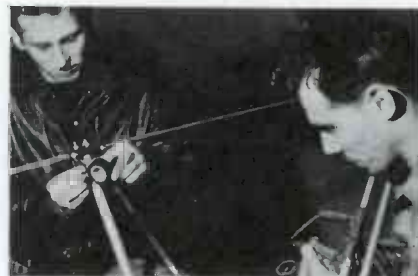


Fig. 8. Electrical tape on antenna lead-in protects against corrosion. Connections (Fig. 8), and taping the lead-in cable to the antenna cross beams and mast will prevent this deterioration. Also, the more solid connections obtained will contribute to improving the signal-to-noise ratio. An all-weather electrical tape is best suited for such an outdoor application.

Circuit Isolation and Protection

Connection points on circuits are often left uninsulated on new equipment. Often these points are located relatively close to ground points such as the chassis or circuit cover



Fig. 9. Exposed portions of circuit are protected when wrapped with tape.

plates, and on occasion a direct short to ground develops. This situation can be remedied easily by placing a strip of tape either over the connection points or on the chassis at the contact area (Fig. 9).

Conclusion

This article has covered only a few of the literally hundreds of uses for electrical tape. Here, the concentration has been on uses helpful in the electronic repair shop, but yet often overlooked by the technician. Tape was never meant to be an identical substitute for the original material. In many cases, however, it does provide an adequate remedy for a servicing problem which may have no other solution.

A roll of tape isn't expensive. In fact, it can pay for itself many times over in the amount of time it will save you. ▲

WELLER ELECTRIC CORPORATION, Easton, Pa.
WORLD LEADER IN SOLDERING TECHNOLOGY

Circle 40 on literature card

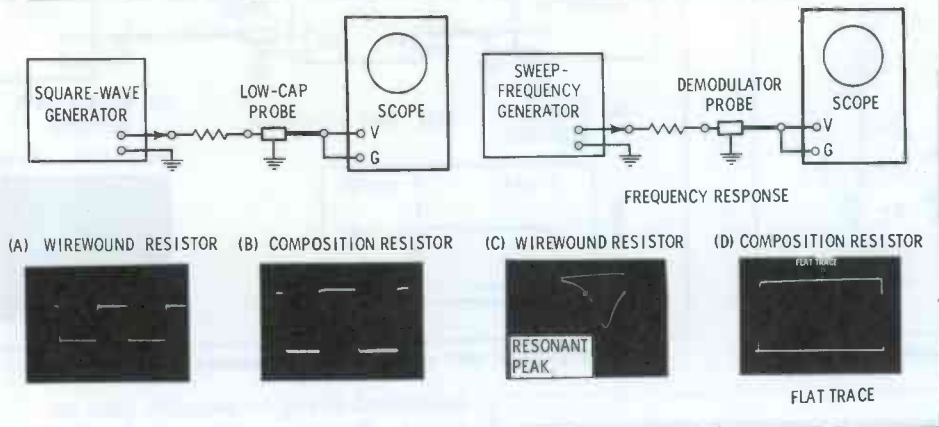


Fig. 5. Both tests supply proof that the wirewound resistor is resonant.

Square-Wave Response vs Frequency Response

A square wave consists of a fundamental frequency and its odd harmonics; the amplitude decreases for each successive harmonic. Rise time of the square-wave leading edge is determined by the highest frequencies present in the square wave. For example, a square wave with a .1- μ sec rise time contains a series of discrete frequencies spaced 200 cps apart and extending from 100 cps to above 3.3mc. Thus, square-wave analysis can be compared to frequency-sweep analysis.

Practical Test

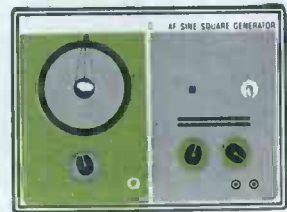
Suppose that you have a 5-ohm resistor and can't tell whether it is a wire-wound or a composition resistor. You don't have to destroy the resistor to get the answer. Either a square-wave test or a sweep-frequency test will tell you immediately. For example, Fig. 5 shows how to check the resistor with either a square-wave generator or a sweep generator. If the resistor is wirewound, the scope displays could

look like those in Fig. 5A, and C. The square-wave response shows overshoot and ringing. On the other hand, the frequency response shows a resonant-frequency curve.

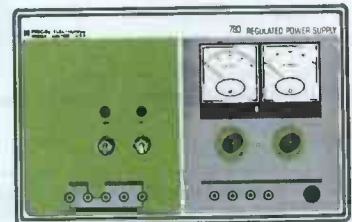
For a composition resistor, you'll obtain displays similar to those in Fig 5B and D. The square-wave response is free from overshoot and ringing. The frequency response is flat. In this example, it would make little difference from a practical standpoint whether a square-wave generator or a sweep generator is used. The test setups are much the same, and waveform analysis is simple in either case.

Analysis

Presence of overshoot and ringing on the square-wave output of the wirewound resistor indicates that this unit is resonant at a particular frequency; frequency-sweep tests verify that the wirewound resistor is resonant. Ringing occurs at the resonant frequency; thus, you can determine a network's resonant frequency by applying a square wave and measuring the ringing frequency. Since frequency is the reciprocal of the waveform period, use the scope



MODEL 636
AF SINE SQUARE GENERATOR — 20 cps to 200 kc in four ranges. Less than 0.25% sine wave distortion at 10 vrms into 600 ohms load.
Kit: \$45.95 Net Wired: \$61.95 Net



MODEL 780
CONTINUOUSLY VARIABLE REGULATED VOLTAGE SUPPLY — Regulated dc output from 0 to +400 v at 150 ma, and 0 to -150 v bias. Also provides unregulated ac. Meters for voltage and current.
Wired: \$99.95 Net



MODEL 905
VACUUM TUBE VOLTMETER — Comes with assembled dc/ac-ohms probe. Direct reading of p-p voltages. Separate ac low voltage scale. Low 0.5 vdc range for transistor circuit measurements.
Kit: \$32.95 Net Wired: \$49.95 Net

Go with the new PRECISE Green Line. It's the scenic route for your test measurements — headed straight for value and accuracy. These unique instruments have color dynamic front panels featuring easy-on-the-eyes Green to aid readability and accuracy. New functional design and layout make operation fast and foolproof. Underneath, they're hopped up with sophisticated circuitry checked out for reliability. That's why, now more than ever, you'll find the going's smoothest with PRECISE test instruments. Go all the way with PRECISE scopes, VTVMs, power supplies, signal generators, tube testers, decade boxes and probes.

PRECISE ELECTRONICS
Division of Designatronics, Inc.
Mineola, L. I., N. Y.

Circle 31 on literature card
January, 1966/PF REPORTER 69

PRECISION TUNER SERVICE
P. O. BOX 272 1210 S. WALNUT ST.
BLOOMINGTON, IND. EDISON 99653

7.95
V or U
COMBO PLUS
9.95 POSTAGE

6-MONTH WARRANTY

All Types T.V. Tuners Cleaned, Repaired and Aligned to Factory Specifications. Same day in shop service on most Tuners. Price Includes Minor Parts, Major Parts at Cost Price. We use Original Parts if possible. State Make Model and Enclose all Parts and Tubes. Pack Well and Insure.
ALSO HAVE LARGE STOCK OF EXCHANGE TUNERS, WRITE FOR TYPES AND PRICES.

Circle 30 on literature card

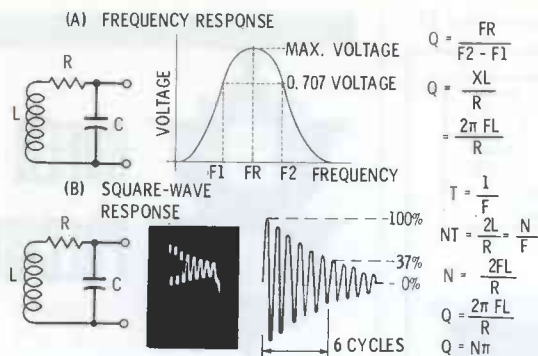


Fig. 6. Circuit Q can be measured with either method.

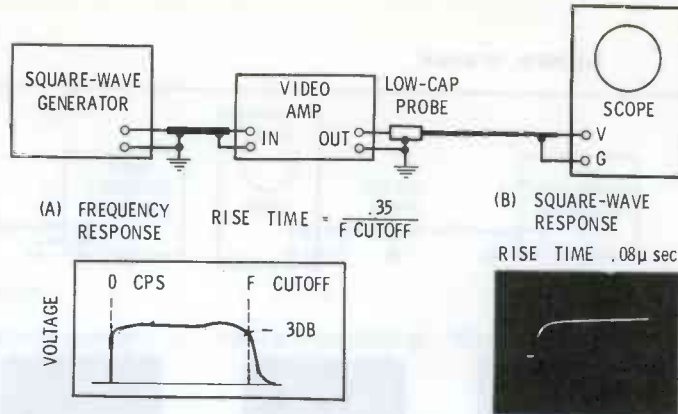


Fig. 7. Rise-time test predicts the frequency response.

9⁵⁰ QUALITY TV TUNER SERVICE 24 hrs. Service Most Makes

ALL PARTS (except tubes) Plus Shipping Charge

UHF - VHF - COLOR - (COMBOS. - 14.50)
15 YEARS OF TUNER EXPERIENCE

- 1 Year Warranty
- Tuners completely cleaned and checked
- Open Account on approved credit
- Dist. write for price structure

Pack Tuner Carefully — Insure Package — Include all parts (Broken or not)

QUALITY TUNER SERV.
5142 W. 25th St.
CHICAGO, ILL. 60650

Circle 33 on literature card

J. W. Miller 4th Video IF replacement for more than 20 Color TV manufacturers

Model 6037 Fourth Video IF Transformer is a high quality replacement for most Color TV sets.

Cross Reference Guide No. 6037 listing manufacturers, models and part numbers has been prepared for quick, easy comparison. Included are a schematic diagram and installation instructions.

Write today or mail reader service card for your copy.



J. W. MILLER COMPANY

5917 South Main Street • Los Angeles, California 90003

See your local distributor for the full line of RF and IF coils, chokes, filters and transformers.

Circle 32 on literature card

calibrated sweep to measure time interval between two succeeding cycles: Frequency = 1/time interval.

Q Measurement

Bandwidth of a resonant circuit is determined by Q. Frequency-sweep tests can be used to determine Q, as the graph in Fig. 6A shows.

In addition, square-wave tests can be used to determine Q (Fig. 6B). The amplitude of the ringing waveform decreases in a manner identical to the decay of a simple RC or RL circuit. Now, however, $1/a$ is substituted for RC or L/R; a , the exponential damping function, is equal to $R/2L$. The ringing-waveform envelope will decrease from 100% to 37% of peak amplitude in $1/a$, or $2L/R$, sec. If N is the number of cycles between the 100% and 37% points and T equals the time interval for each cycle, then $NT = 2L/R$. Since T is the reciprocal of the waveform frequency, then $N/f = 2L/R$, and $N = 2fL/R$. Since $Q = 2\pi fL/R$, multiplying N by π gives $Q: \pi N = 2\pi fL/R = Q$. Q of a circuit at its resonant frequency can be determined by the number of cycles (N) between the points at 100% and 37% of peak amplitude and multiplying the number by π . In Fig. 6, for example, $Q = 6\pi$ or approximately 18.85. Note, however, that this method gives the Q value only at resonance.

Active Network Response

Thus far, only passive (nonamplifying) networks, such as RC and RLC circuits, have been considered. Active (amplifying) networks must also be discussed. Fig. 7A shows a typical frequency-response curve for a video amplifier. High-frequency cutoff is considered to be located at the point where response is 3 db down. This point could be measured

10 facts you should know about color-bar generators

If you are going to buy a color-bar generator—or even if you already own one—here are several facts you should know.

While other types of test instruments may lack one or more features, they may still be useful in skilled hands—provided the user is aware of their shortcomings and provided he has other means of determining what he must know.

This is not true of a color-bar generator.

A color-bar generator should allow you to walk away from an adjusted receiver knowing that the owner can turn it on and receive color broadcasts in full-fidelity color and sound.

Not all color-bar generators can give you this assurance.

Let's talk facts.

FACT NO. 1: *A gated-rainbow type generator is accepted as the standard of the service industry*

You do not need fully saturated NTSC colors to achieve perfect adjustment any more than you need an FCC-type broadcast signal for tuner and if-amplifier alignment. The gated-rainbow type signals are used by virtually all TV manufacturers in establishing service procedures for their sets.



Gated rainbow color-bar pattern

Urgent service needs for a trustworthy color-signal source were met years ago when RCA introduced the gated-rainbow system.

Today, this basic system is used in nearly all service-type color-bar generators. The waveforms and procedures in nearly all color-TV service notes are based on this system.

FACT NO. 2: *All gated-rainbow type generators are not alike*

In spite of their basic circuit similarities, available models differ in their features, accuracy, and ultimate usefulness. Some of these differences are critical.

FACT NO. 3: *The offset subcarrier oscillator must be controlled within a few cycles of its true frequency*

This oscillator controls the phase angles (hues) of the color-bar pattern. It is the heart of the color-bar generator.

The subcarrier oscillator should be within ± 20 cps of its fundamental frequency of 3.563795 megacycles. In the crystal-controlled RCA WR-64B Color-Bar/ Dot/Crosshatch Generator, this deviation is kept well within the ± 20 cps limit.

FACT NO. 4: *Provision must be included to prevent the subcarrier oscillator from drifting off frequency*

The subcarrier oscillator must not only be accurate when the instrument is new—it must

stay accurate. Top-quality components minimize undesirable frequency changes.

Check, for instance, the trimmer capacitor used in the 3.56-Mc subcarrier oscillator. You'll find a piston-type ceramic capacitor—not a flat mica type—in the RCA WR-64B.

FACT NO. 5: *The generator must have an rf-sound carrier to assure proper setting of the fine-tuning control*

Unless your color-bar generator has this essential feature, it may produce a perfect color-bar pattern on the receiver, but at the wrong setting of the receiver fine-tuning control. In such cases, the receiver may not correctly reproduce a color program.

The WR-64B has this necessary feature. With it, you can accurately set the fine-tuning control before making color adjustments. In the WR-64B the rf-sound carrier is also crystal-controlled.

FACT NO. 6: *The rf picture carrier must be exactly on frequency to assure that the color subcarrier is correctly placed in the receiver bandpass*

Drift, faulty adjustment, or aging of components in the rf oscillator section can move the generator picture carrier off frequency. This shift, in turn, will also move the color subcarrier signal away from its correct position in the receiver bandpass. In some receivers, this shift will affect accuracy of color-circuit adjustments.

A separate crystal-controlled oscillator is used in the WR-64B to keep the picture exactly on frequency.

FACT NO. 7: *The axes of the output color-bar pulses should lie on the zero axis—and not on elevated brightness pedestals*

Elevated pulses necessitate use of an oscilloscope for accurate setting of receiver phasing. A generator having zero-axis color-bar pulses, such as the WR-64B, does not require use of an oscilloscope for checking phasing in the customer's home.

FACT NO. 8: *The generator should not require frequent adjustment of internal counter circuits*

All color-bar generators contain circuits which develop vertical and horizontal sync, and dot-and-bar-pattern signals, by dividing or counting down from a higher frequency: usually 189 Kc. If one of these circuits is unstable, the patterns can jitter, ripple, jump sync or contain the wrong number of dots or bars.

Conventional R-C circuits are used in the counters of most generators. But the RCA WR-64B uses inherently stable iron-core in-

ductors in its counters, thereby assuring long-term counter-circuit stability.

FACT NO. 9: *The proper way to check receiver color performance is to feed the generator signal into the antenna terminals*

Color performance depends on overall receiver condition—not on that of a single section alone. A color-test signal fed directly into the video amplifier—rather than through the antenna terminals—will not provide a proper check of the complete receiver. The only method you should use in adjusting the receiver, therefore, is the rf-signal-input method—the method provided by the RCA WR-64B.

FACT NO. 10: *There is no "best" dot size or bar width for convergence adjustments*

Generator dot size or bar width has no significance for convergence adjustments.

Veteran technicians, however, have found that very small dots or thin bars are difficult to use under average lighting conditions. If receiver brightness is turned up to overcome this handicap, blooming will result. Proper convergence cannot be achieved under this abnormal condition.

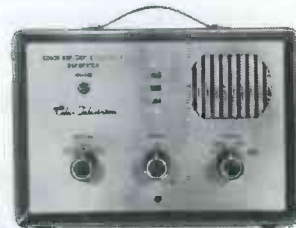
The dot and bar size of the WR-64B is small enough to permit exact, speedy adjustment, and large enough to be useful under average lighting conditions.

These are ten specific facts you should know about color-bar generators. They add up to this

FACT: *The new RCA WR-64B has all the features you need for complete color-circuit adjustment*

It's the one color-bar generator that meets all servicing requirements—from the company that pioneered and developed the color-TV system now in universal use: RCA!

Order it today from your local Authorized RCA Test Equipment Distributor.



\$189.50* *Optional distributor resale price. May be slightly higher in Alaska, Hawaii and the West. Prices subject to change without notice.

RCA ELECTRONIC COMPONENTS AND DEVICES,
HARRISON, NEW JERSEY



The Most Trusted Name in Electronics

DE-SOLDER 50% FASTER



NEW HOT-VAC DE-SOLDERING TOOL

... reduces your PC repair and rework time by half... proved faster in actual use.

- One hand, one operation. HOT-VAC melts and removes solder in one operation, other hand is free to lift components.
- Ungarized coating on tip and other metal components prevents solder from sticking and clogging.
- HOT-VAC features the NEW #777 Clean Room Handle. It's heat stabilized, non-slip, poly grip, won't dust or deteriorate.

Get the full story from your local authorized Ungar distributor or send this coupon.

PAT. PENDING

Ungar

UNGAR ELECTRIC TOOLS, Hawthorne, California 90252 • Dept. P F

Send full information on HOT-VAC

Name _____ Title _____
 Company _____
 Address _____
 City & State _____ Zip Code _____

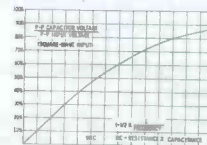
with a marker generator. However, it is somewhat quicker and easier to measure the high-frequency cut-off point with a square-wave generator. The test setup shown in Fig. 7 is used. The output waveform is expanded on the scope screen to measure its rise time, as depicted in Fig. 7B. The rise time is equal to $.35/f$, where f is the cutoff frequency. Suppose that f happens to be 4 mc. Then, $1/f$ is equal to .25 Nsec. In turn, the rise time of the output waveform will be approximately .088 μ sec.

Conclusion

Basic relationships between square-wave and frequency response for multicomponent networks, have been introduced here. In articles to follow, you will be introduced to square-wave tests for active components such as audio and video amplifiers. Keep up with these techniques; they are important now and will be even more so in the future. ▲

Erratum

As has been reiterated in this "Advanced Service Techniques" series, test-equipment limitations must always be considered for any test. Unfortunately, this problem produced errors in both the October and December articles of this series. After our lab square-wave generator was recalibrated, test results on integrators didn't agree with previous data; the error was approximately 20%. After considerable testing and mathematical analysis, it was found that the universal time constant chart will give only an approximate, not exact, re-



lationship between input and output. For example, if $t=RC$, integrator p-p output equals .47 input, and differentiator p-p output equals 1.47 input. The change from conditions given by the universal time constant chart results because the capacitor charges to $1/2$ p-p input, and the DC axis shift reduces the charge voltage. The graph above gives relationships verified by empirical and mathematical analysis.

Inasmuch as the rise-time and $R_1 C_1 = R_2 C_2$ tests aren't dependent upon square-wave generator frequency, no error was induced in these tests; mathematical analysis and even stricter laboratory controls verify their validity.

Compare Color Generators

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

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

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

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

COLOR

CROSSHATCH

STANDARD STATION SIGNAL

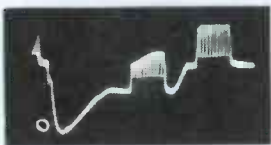


One horizontal sync pulse with its color burst.

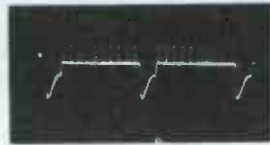


Two lines showing horizontal sync pulse with black and white tv signal.

TRANSISTORIZED B&K MODEL 1245



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

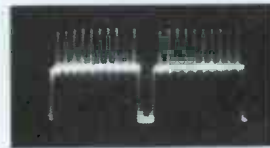


Well defined back porch on horizontal sync pulse permits accurately setting color killer and almost eliminates need to adjust brightness and contrast.

TRANSISTORIZED GENERATOR A



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

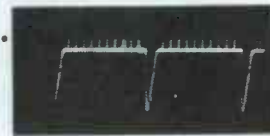


Square wave horizontal sync pulse with no back porch and poor dc coupling forces adjustments of brightness, contrast & fine tuning to obtain usable pattern.

GENERATOR B



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



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

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



For the first time, with the no-compromise waveforms from the B&K Model 1245, it is possible to accurately set the color killer threshold control with a color generator.

The miniature size and convenience of the Model 1245 match its performance. It provides crystal-controlled keyed rainbow color bar display, and dot, crosshatch, horizontal line and vertical line patterns as well as gun killer controls that will work with any picture tube. Size only 2 7/8 x 8 1/2 x 8 7/8". Net \$134⁹⁵.

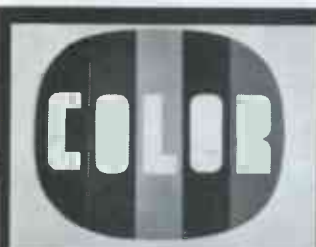
B & K MANUFACTURING CO.
DIVISION OF DYNASCAN CORPORATION
1801 W. BELLE PLAINE AVE. • CHICAGO, ILL. 60613

Export: Empire Exporters, 123 Grand St., New York 13, U.S.A.

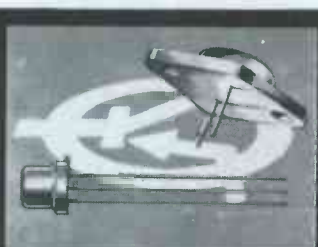


4 ways to increase your income

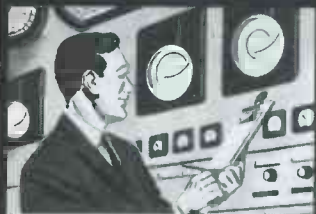
RCA Institutes, Inc. offers these four comprehensive home study courses especially designed to help build your income immediately!



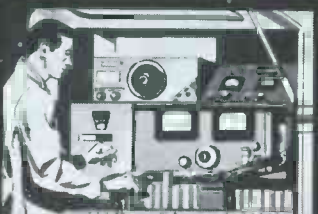
COLOR TV Add Color TV Servicing to your skills with this up-to-the-minute home training course and take advantage of the growing profit potential in this area! Train under the direction of RCA...experts in Color TV.



TRANSISTORS You get the necessary background for semiconductor technology including characteristics of tunnel diodes, rectifiers and other solid state devices. Transistor trainer also available.



AUTOMATION ELECTRONICS Trains you for the many applications of automation electronics in industry and government including Photoelectronics, Digital Computer Techniques, Synchros and Servomechanisms, Automatic Control Systems, and many more!



MOBILE COMMUNICATIONS Trains you to service and maintain 2-way radio communications on land, sea, and air! Gives you the technical foundation for space communications!

Take advantage of RCA's Liberal Tuition Plan. You only pay for lessons you order; and have no long-term obligations. Licensed by New York State Education Department. Approved for Veterans.

RCA INSTITUTES, INC.

A Service of Radio Corporation of America
350 West Fourth Street, New York, N. Y. 10014



The Most Trusted Name in Electronics

SEND THIS COUPON NOW FOR COMPLETE FREE INFORMATION

RCA INSTITUTES, INC. Home Study School, Dept. PF-16

350 West Fourth Street, N. Y., N. Y. 10014

Without obligation, rush me free information on the following RCA Home Training Course: COLOR TV _____ TRANSISTORS _____ MOBILE COMMUNICATIONS _____

AUTOMATION ELECTRONICS _____

Name _____ Age _____

Address _____

City _____ State _____ Zip _____

CANADIANS—Take advantage of these same RCA courses at no additional cost. No postage. No customs. No delay. Send coupon to: RCA Victor Company, Ltd., 5581 Royalmount Ave., Montreal 9, Quebec.

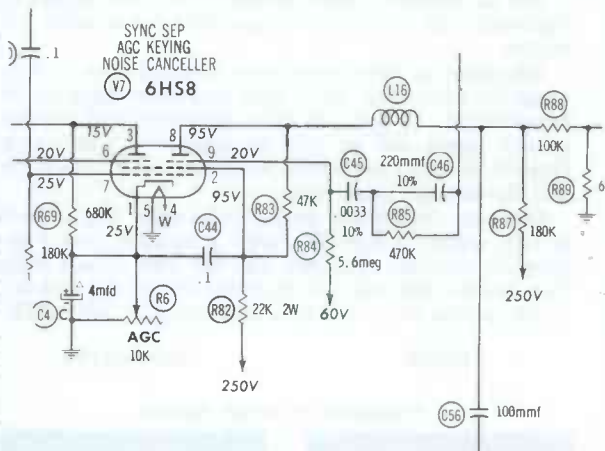
COLOR COUNTERMEASURES

Symptoms and service tips from actual shop experience

Chassis: Zenith 29JC20, 27KC20, 26KC20

Symptom: Loss of horizontal and vertical sync.

Tip: Check for open L16 (Sync Delay Choke Coil). Replace with Zenith part No. S50604 on the 29JC20 or 27KC20 chassis and part No. 20-2702 on the 26KC20, or use the replacement listed in the appropriate PHOTOFAC T Folder.



Chassis: Most color TV receivers.

Symptom: Raster turns brown and slightly dim.

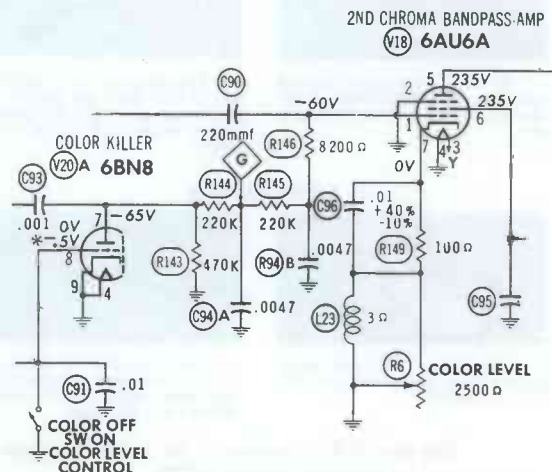
Tip: Replace the video output tube and reset the black-and-white tracking.

Diagnosis: As the video output tube weakens, the video and DC levels both alter at the three cathodes of the CRT. The blue gun usually feels the effects first; the red and green guns operate at a slightly reduced level. Red and green make yellow, and yellow with its brightness component reduced is orange; dimming the luminance signal even further makes brown. Replacing the video output tube restores the brightness component to normal, and resetting gray-scale tracking will return the colors to their proper balance.

Chassis: Zenith (all chassis)

Symptom: Color-off switch, located on the color-level control, fails to kill the color completely. This is more noticeable in a strong-signal area.

Tip: Misadjusted color-killer control or defective tube in the killer circuit.



Brand **NEW** FROM **HICKOK**

DMS-3200 Digital Measuring System



DMS-3200 Main Frame **\$320**
(shown with DP-100)



DP-100
DC Voltmeter
Plug-in
\$175

DP-150
1 MC Counter
Plug-in
\$175

DP-170
Ohmmeter
Plug-in
\$240

DP-200
Capacity
Meter
Plug-in
\$240

HIGHLIGHT FEATURES

- 3-digit Biquinary Tube Read-out
- Plug-in Flexibility
- All-electronic
- Fully-transistorized
- Modular Design
- Fully Field-tested
- Automatic Polarity Indication
- Automatic Decimal Point Indication

AS A DIGITAL DC VOLTMETER (DP100 Plug-in)

- Range 0.1 millivolts to 1000 volts
- Accuracy $\pm 0.1\%$ FS, $\pm 0.1\%$ of reading
- True integrating voltmeter design
- 10 megohms input impedance at all times

AS A DIGITAL 1 MC COUNTER (DP150 Plug-in)

- $\pm 0.005\%$ accuracy: Resolution 1 part in 10^7
- (Overrange capability with sector read-out permits 3-digit display to be equivalent of a 7-digit instrument)
- Frequency measurement range 0.1 cps to 1 mc
- Period measurement range 0.1 ms to 999 seconds

AS A DIGITAL OHMMETER (DP170 Plug-in)

- Range 0.01 ohm to 1,000 megohms
- Accuracy $\pm 0.1\%$ FS, $\pm 0.2\%$ of reading

AS A DIGITAL CAPACITY METER (DP200 Plug-in)

- Range 1.0 picofarad to 10,000 microfarads
- Accuracy $\pm 0.1\%$ FS, $\pm 0.2\%$ of reading

The DMS-3200 is designed for rugged industrial and laboratory applications. By utilizing a design which has the optimum combination of accuracy capability and number of digit display, the DMS-3200 meets the general purpose measurement needs of industry for reliable, precision digital measurement equipment in the \$400-\$500 price range.



new
8290
Shielded Permohm*
 Shown Actual Size



82 Channel TV lead-in

for the strongest, cleanest picture signal and best color... ever!

- Provides 82 channel color reception
- Less installation time and cost
- Eliminates transmission line pick-up of noise and ghost signals
- No expensive matching transformers required
- Can be installed anywhere

Photos courtesy of WGN-TV.



Unshielded twin-lead
 Severe picture disturbance
 due to ignition noise.



Coaxial Cable
 Ignition noise minimized—
 but not eliminated.



*** Shielded Permohm**
 Eliminates automobile
 ignition noise.

■ New 8290 Shielded Permohm TV Lead-in combines the strong signal strength of twin-lead with the clean signal protection of shielded cable. Because it is a balanced line for 300 Ohm TV antennas and receivers, *costly matching transformers and connectors are eliminated.*

8290 is specifically designed for superior color reception on all 82 channels. The twin-lead is encapsulated in low-loss cellular polyethylene insulation, Beldfoil** shielded against all outside disturbances, and protected with a weatherproof

*Belden Trademark—Reg. U.S. Pat. Off.

jacket. A drain wire is provided for grounding the shield to the chassis. The need for stand-offs, twisting or routing of lead-in is eliminated. 8290 can be taped directly to a mast or tower, routed through metal pipe, buried underground, or even installed in rain filled gutters to reduce installation time and cost.

Ask your distributor about 8290 Shielded Permohm TV Lead-in cable, today! Or, write P. O. Box 5070-A for complete information.

**Belden U.S. Patent 2,782,251 and patent pending

BELDEN MANUFACTURING COMPANY

Belden

P.O. Box 5070-A • Chicago, Illinois 60680

8-9-5

Circle 39 on literature card

www.americanradiohistory.com

(Continued from page 38)

A valuable application comes from the laser's ability to drill holes through hard metal (such as razor blades). The laser drill can make holes as small in diameter as one ten-thousandth of an inch (.1 mil) in tungsten wire—holes that are invisible to the naked eye. This unique application can lead to extremely compact and fast microsized memory units for computers. (Compactness and low electrical-energy requirements in computer memories depend on drilling holes very close to each other in magnetic wire. The smaller the holes, the closer together they can be drilled.)

Mechanical drills can punch holes as small as .01" in diameter, and electron-beam drills can make still smaller holes; but both methods are impractical because the metal overheats. The laser drill goes through in a microsecond—so fast the surrounding material never gets a chance to heat up.

Lasers can guide automatic machine tools to tolerances as close as 5 millionths-of-an-inch. Boring-tool spindles, for instance, can be aimed for perfect positioning by a laser fixed to the spindle above the work; a laser beam can be used to perform the actual boring operation.

The laser rangefinder promises to be a boon to surveyors. A microwave-modulated device employs the Doppler radar principle to compare the difference between two signals. The rangefinder samples a portion of its own transmitted signal and compares it with the return from a distant target. The phase of the echo signal changes with time as the light flicks out to the target and returns to the receiver. Detection and measurement of this phase shift gives ranging accuracies down to a fraction of an inch at 10 miles.

Light deflection at electronic speeds has been a major problem in harnessing light for data processing. Now, deflection of a laser beam by electronically switched crystals can project letters, numbers, or other symbols to exact positions on a screen at rates up to several million a second.

The laser beam is first passed through a stencil-like mask of the letter, number, or other symbol to be projected, and then passed through several pairs of crystals. Each crystal pair can give the beam one of two possible directions; each additional pair thus doubles the number of positions available. The laser beam next passes through a crystal which causes the beam to take two possible paths, either deflected or not deflected. This technique can be used in computer memories based on the binary number system, as well as in document reading or display.

The Future

Industry has barely begun to use lasers. More and more uses will be developed, and the present uses refined. It won't be too long till you may—on a service call to some factory or hospital—find yourself face-to-face with a laser device.

You'll need to understand optics as well as electronics, although mechanical and electronic portions will be the more likely points for failure. Some study, some careful analysis, and you may find you're suddenly a laser repairman. ▲

eliminates the time consuming method of unsoldering and resoldering when checking capacitors



The new Model 1400 is the only capacitor to do the whole job. It will quickly find whatever defects exist in a capacitor, no matter how elusive. It will also check electrolytics, by-pass, coupling, blocking, and filter capacitors, all without disconnecting them from the circuit.

SPECIFICATIONS	Tests In-circuit	Tests Out-of-circuit
SHORTS TEST —Detects shorted capacitors of all types in-circuit with shunt resistance as low as 6 ohms.	✓	✓
OPENS TEST —Detects open capacitors for all values in-circuit down to 7 mmfd., with shunt resistance as low as 15 ohms.	✓	✓
VALUE TEST —Indicates value of electrolytics in-circuit from 2 mfd. to 450 mfd.	✓	✓
HI-LEAK TEST —Detects those hard-to-find leaky capacitors out-of-circuit: Sensitive to 150 megohms... Tests made at 300V D.C.		✓

\$29.50 Net

MERCURY ELECTRONICS CORP.

See your parts distributor... or write for complete catalog
315 Roslyn Road • Mineola, New York 11501

Export: Morhan Exporting Corp., 458 Broadway, New York 13, N. Y. IN CANADA: William Cohen Corp., 8900 Park Ave., Montreal



Model 1400 IN-CIRCUIT CAPACITOR TESTER... saves valuable servicing time

EXCLUSIVE—HI-LEAK TEST
Detects those hard-to-find leaky capacitors (out-of-circuit)... leakage sensitivity to 150 megohms.

EXCLUSIVE—Special low test voltage of 2.9 volts provided to prevent damage to the new low voltage electrolytics used in transistorized equipment.

Circle 40 on literature card

there's
**EXTRA
PROFIT in
NOISECTOMIES***



QUIETROLE
IS HARMLESS
TO PLASTICS

Harmless to metal...non-conductive, non-inflammable and non-corrosive. Zero effect on capacity and resistance.

QUIETROLE
Spray-Pack
LUBRI-CLEANER

* a simple quick operation performed by Doctors of Electronics with the aid of Quietrole to cure scratchy, noisy tuners and controls of TV and radio. Fast set recovery with no ill side-effects assured. Saves time... makes money for servicemen.

At Your Distributor . . . Ask for Quietrole by Name.
manufactured by
QUIETROLE CO.
Spartanburg, South Carolina

Circle 41 on literature card

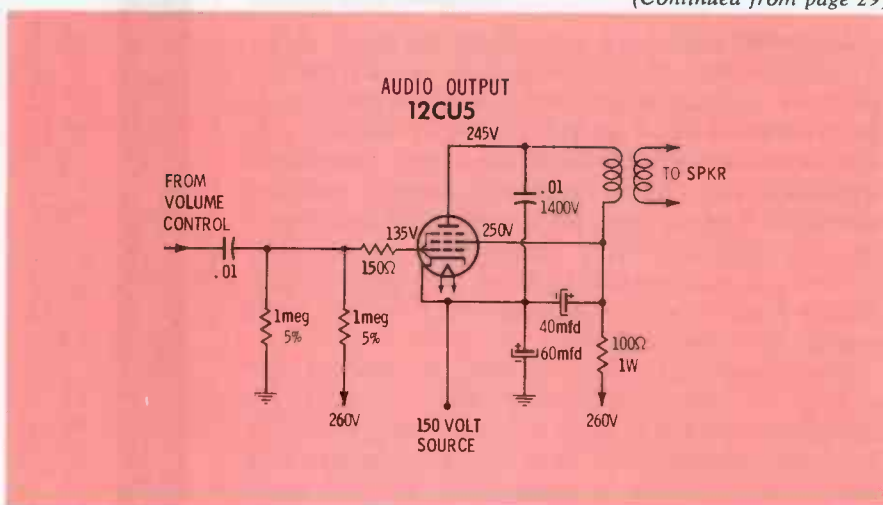


Fig. 4. The 135-volt low B+ is supplied from cathode of output tube.

receiver and found his description of the symptoms was correct; there was absolutely no sound, and the video was extremely weak.

The symptoms could have meant that both the video and audio circuits were defective. However, the fact that some video was present caused me to disregard the video circuits for the moment and concentrate on the audio. I replaced the audio-output, sound-IF, and detec-

tor tubes to no avail. Next I checked the voltages on the output tube (Fig. 4), and they indicated there was trouble somewhere in this circuit. The plate and screen are both fed from the 260-volt source through a load resistor. The source voltage was present at both elements. The fact that there was absolutely no voltage drop across the load resistor meant the output tube wasn't drawing any current. This tube was also being used as part of a voltage divider to supply the low B+ source voltage. The cathode voltage was reduced 85 volts; this accounted for the weak video, since the video-IF amplifiers and tuner tubes were being supplied from this B+ source.

I was convinced that once I found why the tube was not conducting I would have the problem solved. A voltage check at the grid gave a meter indication of 0 volts. The voltage divider network in the grid circuit should have given a reading of 130 volts. The ohmmeter measured 800K from grid to ground, and immediately I suspected that the 1-meg resistor to B+ had increased in value. Since the two 1-meg resistors were measured in parallel via the power-supply filters, this divider should have given a reading of around 500K. Disconnecting one end of the suspected resistor and checking its value verified my suspicion; the resistor measured 5 meg. I replaced the resistor and when I fired up the set there was sound. Once again one component had caused dual symptoms.

The next day, the customer came in to pick up his set, and the first



fat, ugly machine that can make you a lot* of money.

Just so you'll be sure . . . it's an oven. Not for pies. Nor cakes. Not even for pizzas. It's for television picture tubes, and performs chores like tube evacuation, cathode bombarding, induction heating, and more. Most important, it is part of the exclusive Windsor System of picture tube rebuilding — your key to a business you can run (right along with what you're doing right now), and make extra money with in amounts you might not have thought possible (*like \$4,000, \$5,000, \$10,000 a year and more!).

Sound good? Then send for the full story. Write direct, or circle our number right away. Who knows, that happy guy in the picture could be you.

 **WINDSOR ELECTRONICS, INC.**
999 North Main Street
Glen Ellyn, Illinois 60137

Circle 42 on literature card



U. H. F.

HERE

TO STAY

More and more UHF television stations and UHF translator stations are going on the air every day across the country. And the number is increasing rapidly. UHF is accepted... is here to stay.

Every new UHF station represents a whole new untapped profit area for electronics distributors and independent television repair men. Most of the existing television sets now in use were manufactured prior to 1965, and are not equipped with UHF reception. Every TV set owner in your trading area is practically a sure sale for a UHF television converter... *either a built-in or "on-the-top" unit.*

NOW, WHICH MAKE ARE YOU GOING TO SELL TO INSURE HIGH PROFITS?

It's always smart business to stick with a winner. Wherever UHF has gone on the air — Los Angeles, Chicago, Detroit, Boston, Philadelphia, — Standard Kollsman UHF Converters have consistently been Number 1 in distributor preference, dealer preference and consumer preference. *And in the small translator communities, SK's superior performance at the top of the band makes it especially preferred.*

Standard Kollsman quality and dependability means a Final Sale — No Returns. Reliable, service-free tuning elements. Built-in safeguards against spurious radiation. Guaranteed by the world's largest manufacturer of television tuners.



Standard Kollsman
INDUSTRIES INC.

2085 NORTH HAWTHORNE AVE., MELROSE PARK, ILLINOIS

sk means Final Sale, No Returns — Service-free Tuning Element, No Spurious Radiation — Guaranteed 1 Yr. by the World's Largest Manufacturer of T. V. Tuners

words he uttered were, "How much is the bill?"

I handed him the bill, which included the price of the resistor and the nominal shop labor fee.

He paid me and stormed out saying, "I would rather be a TV repairman than have a license to steal; you guys really make a killing!"

Knowing that it is impossible to please everyone and being most thankful that these individuals are few and far between, I proceeded

to the next repair job.

Puzzled by a Diode

The serviceman who had brought another set into the shop had the symptom listed on the shop card as a "terrible" picture. After one look at the screen, I agreed with him wholeheartedly. The picture appeared to be overloaded and the right side was white with almost a complete absence of video. The picture was bending at the top, and hor-

izontal sync was lost completely upon changing channels. Vertical sync seemed to be stable enough, although I was quite sure this was only because the vertical section in this particular receiver required less amplitude and stability in the sync pulses. The sound seemed to be perfect, so I wasn't sure this was an AGC trouble even though it certainly resembled one. Since the sound was normal, I decided to check the video-output circuit before getting involved with the AGC.

With a meter I checked the voltages on the video-output tube and the picture tube. These voltages seemed to be perfectly normal under no-signal conditions; however, with a station tuned in and the controls set for normal operation, the grid voltage on the video-output tube was more negative than it should have been. This led me to believe that the trouble was probably in the video-IF stages even though the set did have good sound. Voltage checks throughout the IF stages proved to be absolutely no help. Resistance measurements in the video-IF stages weren't any help either; thus it was time to use a scope.

Scoping the output of the video detector showed there was an excessive amount of hum in the waveform. The scope, with probe connected to the input to the video detector, showed normal video. Next I used an ohmmeter to check the front-to-back ratio of the detector diode. A good diode should have a ratio of 100:1 or better; however, this one measured only 5:1. Installing a new diode took care of the troubles and relieved me of another multiple-symptoms receiver.

Conclusion

In most cases, troubles are indicative of the circuits at fault. Occasionally, however, many symptoms are caused by only one faulty component. A good way to avoid spending a lot of time in the wrong circuit is to examine closely the schematic for any unusual circuits. If one tube is performing more than one function, always survey the possibilities of what symptoms might occur if an incorrect voltage or signal is present on one of the elements. Time wasted is money lost. So take a couple of minutes to study the schematic before you begin troubleshooting the circuits. ▲

NEW B & K MODEL 606 DYNA-JET

TESTS LATEST TUBES QUICKLY AND ACCURATELY

PORTABLE/LOW COST/PROFESSIONAL

This new B&K Tube Tester provides the sockets and the features you need to test the latest color and compactron receiving tubes, as well as older types.

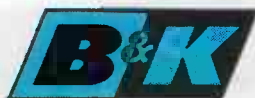
You can test for all shorts, grid emission, leakage and gas; and check cathode emission the accurate way—under simulated load conditions! Each section of a multiple section tube is checked. With the Model 606, you won't reject the good tubes, and you'll quickly find the bad ones, reducing call backs, selling more tubes, and increasing service profit.

You'll find "tough dogs" and weak tubes with the exclusive adjustable grid emission test, which has a sensitivity of over 100 megohms. Tube sockets have phosphor bronze contacts for long, trouble-free life. Complete tube listings are provided in a handy reference index.

This efficient instrument, in a small, handsome, leatherette covered carry case, will perform professionally on house calls or the service bench. Its low price will soon be paid for with increased profit.

Net \$79.95

For additional information write for Catalog AP-22.



B & K MANUFACTURING CO.
DIVISION OF DYNASCAN CORPORATION
1801 W. BELLE PLAINE AVE. - CHICAGO, ILL. 60613

Export: Empire Exporters, 123 Grand St., New York 13, U.S.A.

Circle 44 on literature card

BOOK REVIEW



Fundamentals of Radio; Murray P. Rosenthal; John F. Rider, Inc., New York, New York, 1965; 318 pages, 6" x 9", hard cover; \$8.95.

The basics of radio are covered in the 11 chapters and 2 appendixes of this book. In the first chapter, the author begins with the study of electricity. The structure of the atom and the role it plays in the field of radio are explained. Ohm's law and its relationship to electronics are covered.

Chapter 2 deals with magnetism and electromagnetism, and the third chapter studies various electrical circuits. DC and AC circuits are analyzed, and Kirchoff's laws are explained. Inductance and capacitance and the effects they present to different circuits are discussed.

Vacuum tubes and transistors are covered in Chapters 4 and 5, respectively. The elements that comprise a vacuum tube and the effects they have on the tube's operation are studied. PNP and NPN transistors are defined; reverse and forward bias, which are a necessary aspect of transistor operation, are explained.

The heart of all radio equipment is the power supply. The sixth chapter delves into different types of these supplies; also, filter circuits are investigated.

Chapter 7 concerns itself with amplifiers, and Chapter 8 deals with oscillators. Each category is discussed for both vacuum tubes and transistors.

The ninth and tenth chapters are devoted to radio transmission and antennas. Each subject is thoroughly explained. Chapter eleven covers radio reception; AM and FM receivers are studied as well as stereo multiplex operation.

The mathematics used in the study of radio is reviewed in Appendix 1. Algebra, logarithms, trigonometric functions, and the use of vectors are discussed. How to use the slide rule is also explained in this section. The second appendix is focused on troubleshooting procedures for radio receivers. The use of the volt-ohm-milliammeter (VOM) and vacuum-tube voltmeter (VTVM) is explained.

The beginning student studying basic electronics, as well as the radio and TV service technician, will find a wealth of information in this book. ▲

Mr. TV Serviceman

COLOR programs this fall mean a COLOR fall year for you.

■ STOCK ■ SELL ■ INSTALL

Mosley TV ACCESSORIES

Major network programming is switching to Full Color this fall - - cash in on the service market being created now by increased Color TV Sales. Mosley TV Accessories are designed to provide constant impedance & more efficient signal transfer for flawless reception of Color/B & W. Why risk your reputation and profits on TV Accessories of doubtful quality

. . . . Eliminate antenna system Call Backs

. . . . Encourage customer referrals - - Install MOSLEY TV ACCESSORIES with every antenna you sell & service.



I WOULD APPRECIATE YOUR FREE BOOKLET
"AUDIO AND TV ACCESSORIES BY MOSLEY"
DESCRIBING THE COMPLETE MOSLEY LINE.

"Trudy TV" NAME _____

ADDRESS _____

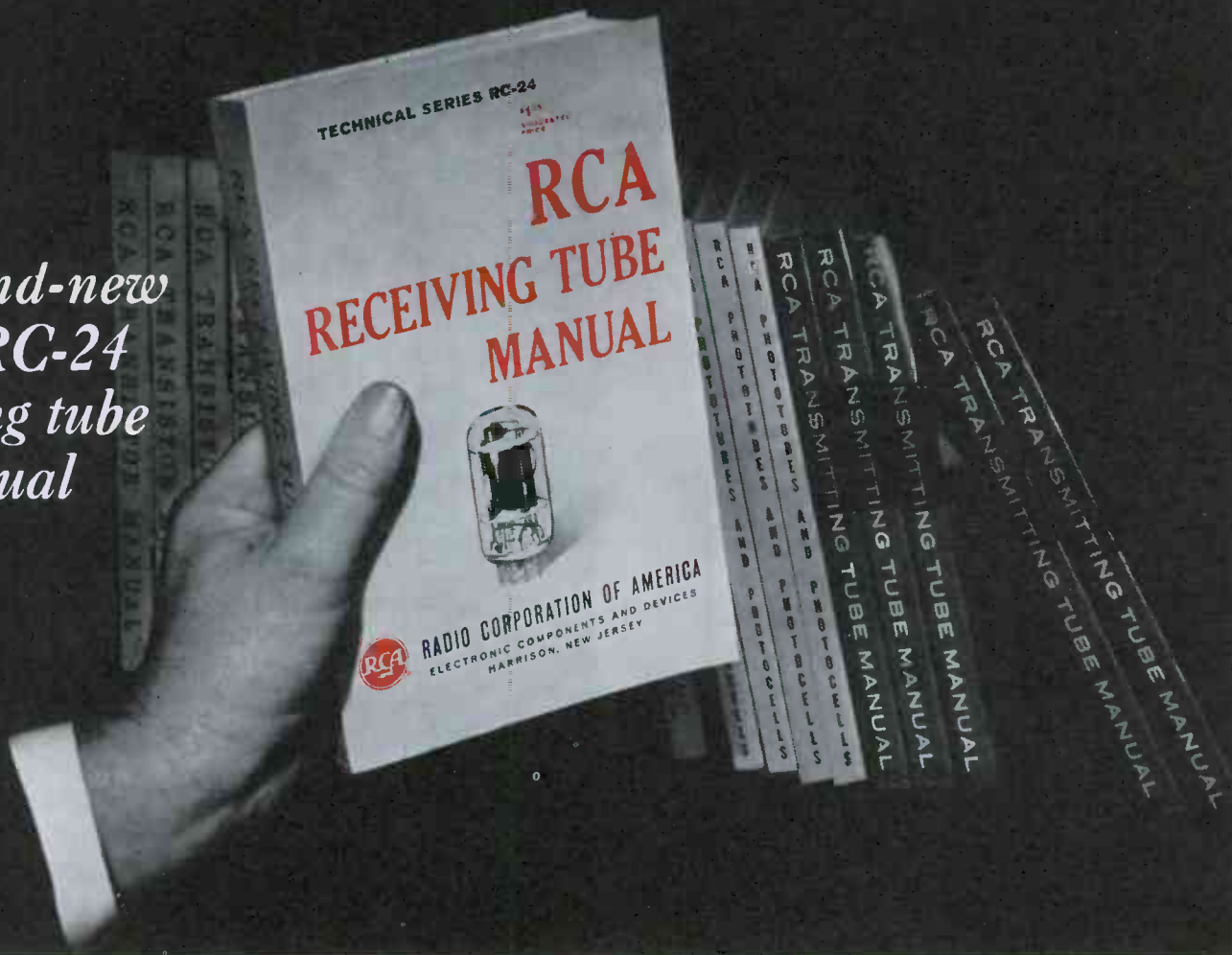
CITY/STATE _____

Mosley Electronics Inc.

4610 NORTH LINDBERGH BLVD. - BRIDGETON, MISSOURI, 63044

Indispensable!

*The brand-new
RCA RC-24
receiving tube
manual*



*Complete-authoritative
A must in every
technical library*

*A must on every work bench
More compact and easier
to read than ever before*

Technical design and applications data on more than 1200 receiving tubes. Check these NEW features and improvements not included in previous editions:

- ✓ Additional data on 100 new tube types
- ✓ Revised circuits section with new, simple format
- ✓ Updated picture tube characteristics chart
- ✓ Revised and updated Applications Guide
- ✓ New tube index section for ready reference
- ✓ Data section on active types only. (Discontinued and replacement types appear in a separate section.)
- ✓ Additional text material on TV in the tube applications section

Everyone concerned with electronics needs this manual... service technicians, engineers, radio amateurs and hobbyists. Order yours today from your nearest Authorized RCA Distributor.

Only \$1.25*
*Suggested Price

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



The Most Trusted Name in Electronics

only picture tube analyzer
that tests all color tubes
as they should be tested!

(THE WAY TUBE MANUFACTURERS DO)



NEW LECTROTECH CRT-100 PICTURE TUBE ANALYZER

FOR COLOR AND BLACK AND WHITE

Does everything . . . you would need **all three units** of the leading competitive brands to equal the performance of the Lectrotech CRT-100. No other brand has all the features . . .

- Line voltage adjustment (to insure all tube voltages are correct regardless of line voltage).
- Critical Grid-to-Cathode Leakage is read on sensitive meter for greatest accuracy.
- Leakages in all other elements are indicated on neon lamp.
- Tests **all** black and white and **all** color tubes for leakage, shorts and emissions.
- Tests each color gun separately.
- Tests each color gun to a standard set of tests conditions. With variable G-2 voltage, each grid is normalized to a reference cut-off voltage. This method is used by tube manufacturers and simulates tube performance in color receiver.
- Rejuvenates and removes shorts on both color and black and white tubes for increased brightness.
- Life expectancy test, predicts remaining useful life of both color and black and white picture tubes.
- Continuously variable G-2 voltage for all tubes, present and future, including new 15 inch color tubes.
- Complete plug-in cables for easy replacement.
- Complete self-contained black and white socket assembly. No adapters to lose or cables to break.
- Including Pilot Light.

Only **89⁵⁰**



ONE YEAR WARRANTY

See your distributor or write DEPT. PF-1

LECTROTECH, INC.

1221 Devon Ave., Chicago, Illinois 60626

Circle 48 on literature card



The Troubleshooter

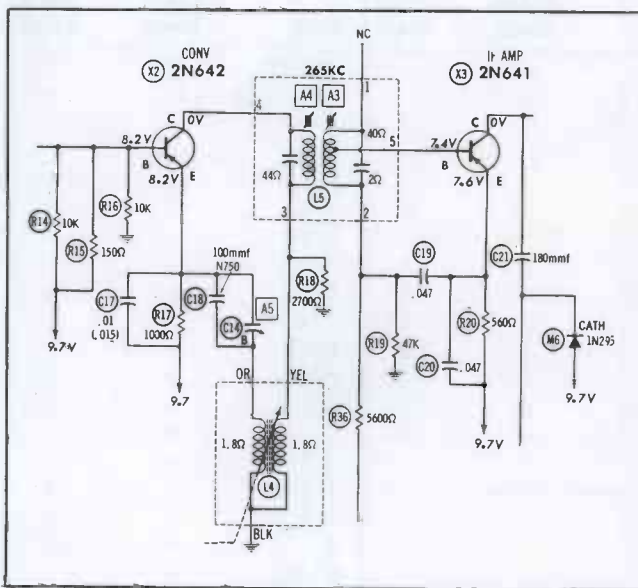
answers your servicing problems

Transistor Shorts

I am having trouble with a new Automatic tractor radio (all transistor) Model TR 0048 (covered in PHOTOFACT Auto Radio series AR-25). The radio failed to work when initially installed. I checked the unit and found 6 volts on the collector of the converter (X2). The lead from X2 to L5 was disconnected, and the 6 volts remained on the collector. The converter transistor was replaced, and the radio operated on the bench for two hours. It was installed on the tractor and three days later was back in the shop with the same trouble. I checked the unit and found the same condition that existed originally. Another converter transistor was installed, and again the radio played fine on the bench. However, after installing it on the tractor, I'm confronted with the same problem. The emitter and base voltages remain the same and agree with those listed on your schematic.

M. C. PATTERSON

LuVerne, Iowa



Your description of the symptoms indicates an intermittent connection or short in or around L4. Also, check R18, L5 and the surrounding circuitry. Apparently, after the radio is installed on the tractor, a short exists in a circuit associated with X2 and causes the transistor to break down. This could be caused by mechanical stress placed on the unit when it is mounted. Also, a tractor is usually subject to sudden jars and bounces, and this could lead to a short if some leads were close enough that additional movement would cause them to touch. Mechanical stress could be applied to the unit when you have it on the bench to see if the condition could be made to appear. A thorough check of all wiring should be made.

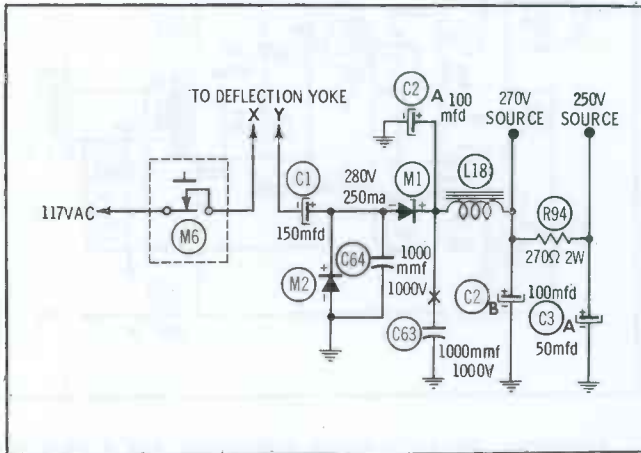
Vertical Bar Drifts Through Picture

I've been trying to cure a trouble symptom in an Admiral television chassis 15D1B (covered in PHOTOFACT Folder 471-1),

and everything I've tried has been to no avail. A pale white bar, about 2" wide, moves up from the bottom of the screen to the top. The picture has a horizontal bend at this bar, and when the bar reaches the top, the picture rolls for a short time. After this sequence, everything is normal for a brief interval; then the bar starts its upward journey again. I've tested and substituted practically every component from the 3BU8 noise-limiter/sync-separator/AGC-keying tube to the 10DE7 vertical-multivibrator and output tube. Scoping through the video IF section, I find the video signal from the first IF distorted with what appears to be 60-cps hum. I would certainly appreciate some help.

C. O. JACKSON

East Providence, R.I.



It appears that you have 60-cps hum on the video line. You might try bridging the electrolytics in the power supply to see if the picture clears up.

Silicon rectifiers are used in this receiver, and often a bar such as you described is caused by radiation from the silicon rectifiers (they have a slight internal arcing), which is picked up by the tuner. You'll notice that C64 shunts rectifier M2, but M1 is not shunted. You might try replacing C64 and, in addition, shunting M1 with a similar .001-mfd capacitor.

Yokes Won't Last

I have a Zenith TV with a 16G27 chassis. (This particular chassis was covered in PHOTOFAC T Folder 551-2.) I have checked everything I can think of, but this set continues to break down deflection yokes. I have tried three different makes of yokes, and each of them lasted only one to two hours. The yoke gets very hot, and the horizontal and vertical windings short. Boost voltage is normal. I substituted new damper and horizontal-output tubes with no success. All capacitors associated with the yoke were replaced. The picture looks good, even when the yoke is hot, and fills the screen completely.

E. HALEY

Olympia, Wash.

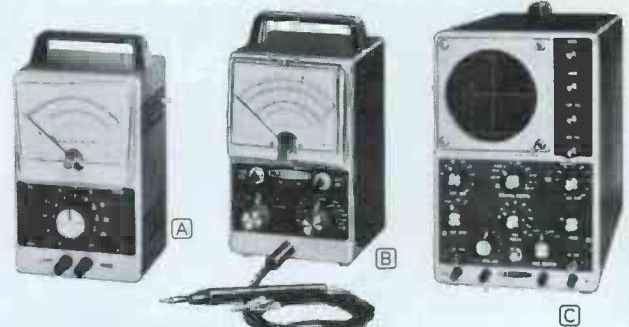
The recurring failure of deflection yokes in this receiver is probably caused by the width sleeve, located between the deflection yoke and the neck of the picture tube. This sleeve should have cardboard insulation to prevent arcing between the windings of the yoke and the metallic sleeve. I suggest you remove the width sleeve, turn the receiver on, and let it operate for a couple of hours. Check the yoke frequently to see if it is still overheating.

Weak Audio

An Airline TV Model 5093A (covered in PHOTOFAC T Folder 480-2) is in my shop and has an audio problem. I turned the set on, and the plate of V8 glowed red. R54, connected from one end of the secondary of T6 to ground, started to overheat

KIT OR ASSEMBLED!

Either Way, These HEATH Instruments Are Your Best Buy!



A) Heathkit IM-21 Laboratory AC VTVM.
 • 10 voltage ranges—0.01 to 300 volts RMS full scale • 10 megohm input Z
 Kit IM-21, 5 lbs. \$33.95
 Assembled IMW-21 \$52.95

B) Heathkit IM-11 VTVM . . . Versatile!
 • 7 AC, 7 DC, 7 Ohms ranges • Frequency response ± 1 db, 25 cps to 1 mc.
 Kit IM-11, 5 lbs. \$24.95
 Assembled IMW-11 \$39.95

C) Heathkit Wide-Band Oscilloscope
 • 5 mc bandwidth • Sweep 10 cps to 500 kc • 5" screen with graticule
 Kit IO-12, 24 lbs. \$76.95
 Assembled IOW-12 \$126.95

D) Heathkit IM-13 "Service Bench" VTVM
 • 7 AC, 7 DC, 7 Ohms ranges • Extra-large 6" meter • Gimbal mounting
 Kit IM-13, 7 lbs. \$32.95
 Assembled IMW-13 \$49.95

E) Heathkit Power Supplies
 Kit IP-32, Variable Voltage. \$56.95
 Assembled IPW-32 \$84.95
 Kit IP-20, Solid State \$72.95
 Assembled IPW-20 \$114.95
 Kit IP-12, Battery Eliminator. \$47.50
 Assembled IPW-12 \$59.95

F) Heathkit Audio Generator • Switch-selected output—10 cps to 100 kc • Near-perfect sine wave
 Kit IG-72, 8 lbs. \$41.95
 Assembled IGW-72 \$64.95

G) Heathkit RF Signal Generator • Covers 100 kc to 110 mc.
 Kit IG-102, 6 lbs. \$27.95
 Assembled IGW-102 \$54.95

H) Heathkit Condenser Checker • Check capacitors 10 uuf to 1000 mfd.
 Kit IT-11, 7 lbs. \$29.95
 Assembled ITW-11 \$49.95



FREE CATALOG

Fully describes these and over 250 other different and exciting Heathkits at savings of 50% or more! Fill out the coupon and send for your FREE copy today!

HEATH COMPANY, Dept. 25-1
 Benton Harbor, Mich. 49023

Please send my free 1966 Heathkit Catalog.
 Enclosed is \$_____, plus postage.
 Please send model(s) _____

Name _____ (Please Print)

Address _____

City _____ State _____ Zip _____

Prices & Specifications subject to change without notice.

TE-139



Product Report

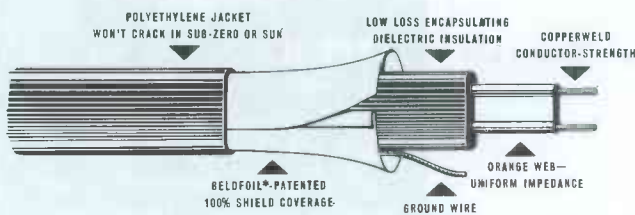
For further information on any of the following items, circle the associated number on the Catalog & Literature Card.



CRT Checker-Rejuvenator

(140)

This CRT tester and rejuvenator checks the new black-and-white and color picture tubes. All the necessary sockets, including those for the latest rectangular color tubes, are mounted on two permanently attached cables. The SENCORE CR128A is an up-dated and improved version of the CR128. The new model has a variable G2 control replacing the old three-position G2 switch. The automatic controlled rejuvenation feature, which allows safe rejuvenation of picture tubes, was retained. The unit checks for emission, shorts, interelement leakage, gas, and expected tube life. It weighs 10 lbs and measures 10" x 9" x 3 1/2". The price is \$74.95.



*PAT. NO. 3,032,604

Shielded Lead-In

(141)

"8290 Shielded Permohm" is a 300-ohm lead-in encapsulated in a cellular polyethylene insulation and enclosed in a foil shield that stops transmission-line pick-up of electrical noise (including automotive ignition noise). An outside polyethylene jacket covers this Belden lead-in. It can be installed through metal pipes, secured to steel supports, placed underground, under water, or in salt areas without adverse effects. Standoffs at the antenna are not required; the 8290 can be taped to the mast. It is furnished in 50, 75, and 100' lengths with factory-installed terminals, in addition to bulk lengths.

Communications, mobile radio...

A First Class FCC License

...or Your Money Back!



Your key to future success in electronics is a First-Class FCC License. It will permit you to operate and maintain transmitting equipment used in aviation, broadcasting, marine, microwave, mobile communications, or Citizens-Band. Cleveland Institute home study is the ideal way to get your FCC License. Here's why:

Our training programs will quickly prepare you for a First-Class Commercial Radio Telephone License with a Radar Endorsement. Should you fail to pass the FCC examination after completing your course, you will get a full refund of all tuition payments. You get an FCC License... or your money back!

You owe it to yourself, your family, your future to get the complete details on our "proven effective" Cleveland Institute home study. Just send the coupon below TODAY. There's no obligation. Cleveland Institute of Electronics, 1776 E. 17th St., Dept. PF-27, Cleveland, Ohio 44114.

NEW in 1966

Only CIE offers new, up-to-the-minute lessons in all of these subjects:

- Logical Troubleshooting
- Laser Theory and Application
- Microminiaturization
- Single Sideband Techniques
- Pulse Theory and Application
- Boolean Algebra

Cleveland Institute of Electronics

1776 E. 17th St., Dept. PF-27
Cleveland, Ohio 44114

Please send FREE Booklet "HOW TO GET A COMMERCIAL FCC LICENSE," without obligation.



Your present occupation _____

Name _____ Age _____
(please print)

Address _____

City _____ State _____ Zip _____

A leader in Electronics Training... since 1934

you get extra safety with new Centralab miniature electrolytics

These closer tolerance, higher temperature, epoxy sealed capacitors will reduce callbacks and increase your service profits.

They operate at higher temperatures . . .

-20°C to +85°C: 20° higher than the prevalent +65°C maximum for miniature types, thus providing an extra margin of safety during use.

They're closer tolerance . . .

+100%, -0% thus providing assurance that every unit will provide the required circuit capacitance, eliminating problems in critical circuits.

They'll last longer . . .

as a result of their better temperature stability, better tolerance and epoxy sealed cases.

They're small . . .

so they'll always fit.

They're available in the types you need . . .

every voltage requirement up to 50 VDCW with both axial and printed circuit lead styles.

They're in stock at your distributor . . .

along with a full selection of low voltage ceramic and polystyrene capacitors for semiconductor circuitry. Ask for them on your next order, or write for a complete catalog to Distributor Products, Centralab, P. O. Box 591, Milwaukee, Wisconsin 53201.

Centralab

DIVISION OF GLOBE-UNION INC

Circle 52 on literature card

D-6601



Recording Tape

(144)

Three types of Dynarange Series tapes, manufactured by The 3M Company, are on 7" reels and meet most needs for sound recording and playback. The No. 201 (shown in photo) is designed for economy and stretch resistance, 202 for added strength, and 203 for extra playing time as well as tough use. List prices are \$4.40, \$5.10, and \$7.35, respectively. The same tapes on 5" reels list for \$2.80, \$2.85, and \$4.25, respectively.

Vertical Cutters

(145)

This tool has a vertical blade which permits cutting in hard-to-reach areas on welded modules. The Tip-O-Dyke, offered by Hunter Tools, provides maneuverability and visibility in cramped quarters

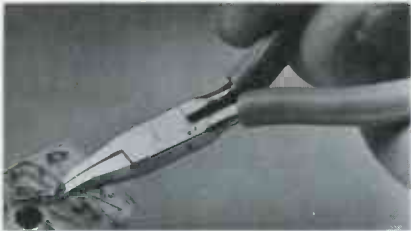


TYPE II . . . why use old fashioned wax end-filled cardboard capacitors in radio repairs? Avoid call-backs with Planet type II dual section tubular electrolytics . . . hermetically sealed in aluminum tubes with wax impregnated insulating jacket. Planet II's are also available in 450 volts for TV servicing. Ask for them by type number at your distributor.

PLANET SALES CORP.

225 Belleville Ave.
Bloomfield, New Jersey

Circle 53 on literature card



and cuts .007" x .015" nickel ribbon. Overall length is 4 1/4"; tip length is 1/8"; width across joint is 5/16". The price is \$11.73.



FM Two-Way Radio

This transistor FM two-way communications unit is designed for mobile service in the 148- to 174-mc band. The Hallcrafters Commander "Thirty-Two" measures 3 1/2"x10 1/4"x15 1/4", and has a rated output of 30 watts minimum. The transmitter/receiver chassis, control head, with built-in speaker are housed in a single cabinet. A key lock on the charcoal gray cabinet prevents unauthorized access. Additional channel and tone-coding options as well as separate chassis and control-head mounting are available.

RTS **RELIABLE TV TUNER SERVICE**
 616 1/2 Garden Avenue
 Olean, N. Y. 14760

**VHF TUNERS
 ALL LABOR
 AND PARTS**
 [except tubes] **\$9.22**
 plus shipping charges

All tuners are aligned to manufacturers specifications and are air tested. Pack the tuner complete with shields, tuner cover and any damaged parts if any. State model number and complaint. Your tuner will be carefully overhauled and promptly returned with a 90-day warranty. **LOWER PRICES ARE OFFERED ACCORDING TO TIME SPENT ON REPAIR OF TUNER.**

SEND FOR FREE MAILING KIT & LITERATURE CIRCLE NO.

Circle 55 on literature card

IT'S HERE! KAY-TOWNES' NEW

colorphase

ANTENNA FEATURING THE PIGGY-BACK POWER PACK

FOR THE BIG **EXTRA PUNCH** NEEDED TO PRODUCE
 THE BEST IN **COLOR** AND IMPROVED
 BLACK AND WHITE RECEPTION

The new Kay-Townes COLORPHASE antenna line with Piggy-Back Power Pack is designed to meet every need in every area. Check such features as the insulator—extra rugged, moulded of special materials to withstand shock, fatigue and the ultra-violet rays of the sun . . . the sleeve reinforced elements, the new swing lock that allows antennas to be packed in smaller cartons for less storage space and easier handling. And like all Kay-Townes antennas, COLORPHASE has the unique Kay-Townes phasing system. It comes completely assembled with two-piece mast-clamp double locking and reinforcing the crossarm. No boom braces are necessary.

POWER PACK

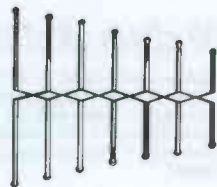
CP-28G

**6 MODELS
 FOR EVERY PURPOSE**

<p>CP-23G—9 active driven elements complete with Power Pack. List \$44.80</p> <p>CP-19G—9 active driven elements complete with Power Pack. List \$35.05</p>	<p>CP-28G—9 active driven elements complete with Power Pack. List \$53.75</p> <p>CP-15G—7 active driven elements complete with Power Pack. List \$26.10</p> <p>CP-11G—5 active driven elements. List \$20.19</p> <p>CP-7G—3 active driven elements. List \$13.02</p>
-------------------------------------------------------------------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

GENUINE GOLD ANODIZED — Not A Spray To Wash Away!

ALL WITH THE KAY-TOWNES ORIGINAL PHASING SYSTEM



This unique system providing high gain, high front to back ratio was developed by Kay-Townes in 1954 and is the most copied system used in antenna design today, having been renamed by other manufacturers as LOG-PERIODIC, etc. Incorporated in this system is a solid rod, all-aluminum, one-piece construction with special insulator at every crossover point eliminating possible shortouts.

Kay-Townes is not a member of any association. Dedicated to the manufacture of only the finest quality antenna systems, it needs no "association" other than the growing thousands of satisfied users who have experienced the fine reception provided by Kay-Townes Antenna Systems.



SALES TERRITORIES OPEN IN SOME AREAS



QUALITY • PERFORMANCE • ECONOMY

KAY-TOWNES antenna company

HEADQUARTERS OFFICE AND PLANT — 1511 DEAN AVE., ROME, GA. 30162
 ALSO MANUFACTURING AND SALES OFFICE IN RINCON, PUERTO RICO

OVER 800 ANTENNA MODELS FOR EVERY AREA — EVERY PURPOSE

Circle 54 on literature card

Solid-state CB mate

The best way to ring up more 10-2s with the new solid-state transceivers is by using one of the new low-impedance Sonotone Ceramikes®. They are designed specifically for all-transistor transceivers. Transmission is loud and clear, and Ceramikes are built to take abuse. Get the low-impedance "CM-3050" or the "CM-3050M" with Magnetic Mount, today. Also Models "CM-30" and "CM-30M" for tube transceivers. Prices start at \$15.75. Write for Free catalog SAH-7.



SONOTONE
audio products

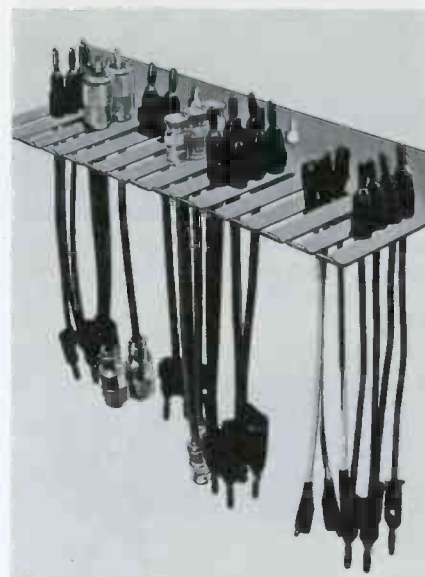
Sonotone Corp., Electronic Applications Div., Elmsford, N. Y.

Circle 57 on literature card



Silicone Spray (146)

This spray eliminates friction and drag when applied to plastic tubing or spaghetti prior to insertion on leads or hook-up wire; also, will solve problems requiring a release agent. It dries immediately with no buildup; and is nontoxic, colorless, heat stable, and nonflammable. Sprayway silicon spray is available with spray heads for pinpoint application.



Test Lead Holder (147)

This handy test-lead rack is designed to store patch cords and cable assemblies used in electronic testing. The rack, manufactured by Pomona Electronics Co., Inc., simplifies the job of locating a particular test lead by providing convenient, orderly storage that is readily accessible. The unit accepts cables up to 1/2" in diameter. Mounting holes are provided for installation on any vertical surface. The holder, with baked enamel finish, is priced at \$1.95. ▲

new!

All-Transistor Color Bar Generator

Rugged, solid-state Seco 900 puts you on top of the booming Color-TV Service Market... with the finest unit in the field!

Setting new standards in both engineering and design, Seco's new Model 900 will outperform every other color bar generator on the market! A true precision instrument that offers brightest dots and purest color quality, the 900 takes the "guess" out of color TV-servicing; makes possible big new profits in the booming color service field!

Only the Seco 900 offers all of these features:

*Compare — we'll match the 900's performance against any color bar generator in the popular priced field!

- Single Burst Dots are bright—"rock" solid... will not move
- Purest Color Quality—10 completely different color bars... positive graduation from color to color
- Single Trace Horizontal Lines—are bright, sharp... begin and end during horizontal retrace
- No Blinking On Cross Hatch—at any intensity level
- All Transistor Circuit—for highest reliability and instant operation with no warm-up
- Outstanding Stability—Zener regulated power supply... crystal controlled oscillators!



SECO ELECTRONICS CORP., 1207-B So. Clover Dr., Minneapolis, Minn. 55420

\$12995

Dealer Net



Circle 56 on literature card

brand new
... and very important ...

QUAM COLOR TV REPLACEMENT SPEAKERS PREVENT COLOR PICTURE DISTORTION

OFTEN CAUSED BY STRAY
MAGNETIC FIELDS FROM
ORDINARY LOUDSPEAKERS



When you use an ordinary loudspeaker in a color TV set, you're looking for trouble ... picture trouble. The external magnetic fields from standard loudspeakers will deflect the primary color beams, causing poor registration and distorted pictures.



QUAM RESEARCH SOLVES THIS PROBLEM

An entirely new construction technique, developed in the Quam laboratories, encases the magnet in steel, eliminating the possibility of stray magnetic fields and the problems they cause! These new Quam speakers have been eagerly adopted by leading color TV set manufacturers. Quam now takes pride in making them available for your replacement use. Five sizes (3" x 5", 4", 4" x 6", 5 1/4", 8") ... in stock at your distributor.

QUAM

QUAM-NICHOLS COMPANY

234 E. Marquette Rd. • Chicago, Ill. 60637

Circle 58 on literature card

INDEX TO ADVERTISERS

JANUARY, 1966

Aerovox Corp.	22
Amphenol-Borg Corp.	27
Antennacraft Co.	65
Belden Mfg. Co.	76
B & K Mfg. Co. Division of Dynascon Corp.	35, 73, 80
Blonder Tongue Labs	64
Bussmann Mfg. Div.	24, 25
Castle Tuner Service	23
Centralab, Div. of Glove-Union, Inc.	88
Chemtronics, Inc.	67
Channel Master Corp.	26, 58, 59
Cleveland Institute of Electronics	87
Electro-Voice, Inc.	41
Finney Co.	21
Heath Co.	85
Hickok Electrical Instrument Co.	75
Injectorall Co.	62
Jensen Mfg. Co.	63
Jerrold Electronics	Cover 2, 86
Kay-Towne Antenna Co.	89
Lectrotech, Inc.	84
Littelfuse, Inc.	Cover 4
Mercury Electronic's Corp.	77
Mid-State Tuner	62
Miller, J. W. Co.	70
Mosley Electronic's, Inc.	81
Philco Corp.	66
Planet Sales Co.	88
Precise Electronics	69
Precision Electronics, Inc.	67
Precision Tuner Service	69
Quality Tuner Service	70
Quam-Nichols Co.	91
Quietrole Co.	78
RCA Components & Devices	Cover 3, 71, 82
RCA Sales	57
RCA Institutes	74
Reliable TV Tuner Service	89
Rohn Mfg. Co.	38
Sams, Howard W. & Co.	61, 91
Sarkes Tarzian, Inc.	17
Seco Electronics, Inc.	90
Sencore, Inc.	48, (insert) 49, 50, 51, 52, 53, 54, 55, 56
Sprague Products Co.	19, 20
Sonotone Corp.	90
Standard Kollsman Industries, Inc.	79
Sylvania Electric Products, Inc.	47
Texas Crystals	67
Ungar Electric Tools	72
Winegard Co.	42
Windsor Electric Co.	78
Weller Electric Corp.	68

new SAMS BOOKS

Computer Dictionary



by Charles Sippl. The most complete definition and spelling reference available on the entire field of data processing and the systems and equipment now in use. Defines over 3000 terms and concepts. Valuable appendixes include information on sources for computer equipment, personnel training, mathematical definitions, COBOL, FORTRAN, ALGOL, QUIKTRAN, etc. The author is a teacher of computer science on the faculty of the University of California.

This authoritative book is of tremendous value to students, engineers, or anyone whose work involves the use of computers. 320 pages; 6 x 9". \$4.95
Order CDS-1 (softbound), only \$4.95
Order CDH-1 (hardbound), only \$6.95

North American Radio-TV Station Guide

by Vane A. Jones. New Third Edition. Lists frequencies, call letters, locations, etc., for all AM, FM, and TV stations in the U.S. and its possessions, Canada, Cuba, Mexico, and the West Indies. Includes over 5000 AM stations, over 1500 FM stations, and nearly 1000 VHF and UHF TV stations. This new edition now gives all VHF TV stations by channels. Most accurate and up-to-date station guide available. 128 pages; 5 1/2 x 8 1/4". \$1.95
Order RSG-3, only \$1.95

Eliminating Engine Interference

by John D. Lenk. An authoritative book on the causes and cures of noise in mobile communications receivers. Explains how the electrical system of an engine creates radio interference and what can be done to eliminate it at the source. Describes and analyzes squelch and noise-limiter circuits. Discusses commercial suppression and shielding kits as well as electronic circuits which can be added to the receiver. An invaluable book for mobile radio operators (amateur, two-way, CB, and marine), and maintenance and repair technicians. 112 pages; \$2.50
5 1/2 x 8 1/4". Order EIL-1, only \$2.50

Replacement Guide for TV & Auto Radio Controls

1966 Edition. Bigger and better than ever—covers more than 45,000 TV and 2,100 auto radio models. Lists recommended replacement controls made by Centralab, CTS-IRC, and Mallory. 192 pages; \$1.00
8 1/2 x 11". Order RGC-7, still only \$1.00

LATEST COLOR-TV BESTSELLERS!

Color-TV Servicing Guide



by Robert G. Middleton. This great new book on color-TV troubleshooting follows the same picture-tube-and-trouble-symptom format made famous in the best-selling *TV Servicing Guide*, now used by more than 100,000 servicemen. Shows how to apply fast troubleshooting procedures, based on an analysis of trouble symptoms. Includes many full-color picture tube photos illustrating various operating

troubles, accompanied by clear, concise explanations of probable causes and diagnosing procedures. Takes you through each section of the color-TV receiver, describing the symptoms for various types of troubles. A final chapter explains in detail how to test and service color-bar generators. If you service color-TV, this book is a gold-mine of help. \$3.95
112 pages. 8 1/2 x 11". Order SGC-1, only \$3.95

OTHER SAMS COLOR-TV SERVICING BOOKS

Color TV Training Manual (new 2nd Edition), by Oliphant & Ray. Order TVC-2, only \$5.95
Color TV Servicing Made Easy, by Wayne Lemons and Carl Babcoke. Order CSL-1, only \$2.95
Know Your Color-TV Test Equipment, by Robert G. Middleton. Order KOC-1, only \$2.50

HOWARD W. SAMS & CO., INC.

Order from your Sams Distributor today, or mail to Howard W. Sams & Co., Inc., Dept. PF-1
4300 W. 62nd Street, Indianapolis, Ind. 46206

Send me the following books:
 CDS-1 RSG-3 RGC-7 TVC-2 KOC-1
 CDH-1 EIL-1 SGC-1 CSL-1
 Send FREE Sams Booklist. \$ _____ enclosed

Name _____
Address _____
City _____ State _____ Zip _____
My Distributor is _____



FREE Catalog and Literature Service

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

Please allow 60 to 90 days for delivery.

ANTENNAS & ACCESSORIES

75. **ALLIANCE** — Colorful 4-page brochure describing in detail all the features of *Tenna-Rotors*.
76. **ANTENNACRAFT**—Literature featuring 3 new 75-ohm, all-channel TV antennas available in factory-built or kit form.
77. **BLONDER-TONGUE** — Booklet titled "How to Plan a Home TV System" containing information on required components and cable with diagrams of actual systems. Written for both homeowner and technician.*
78. **CORNELL-DUBILIER**—New 3-color 8-page booklet describing line of antenna rotors and six colorful flyers each featuring a system.
79. **FINNEY** — Catalog 20-337 covering U-Vert series UHF converters and catalog 20-338 on Model 65-1 distribution amplifier.*
80. **HY-GAIN**—Brochures featuring antennas and accessories for SWL and Citizens-band use.
81. **JERROLD** — Colorful six-page brochure describing and explaining coax, matching transformers, and antenna amplifiers.*
82. **JFD**—Literature on complete line of logarithmic antennas for VHF, UHF, FM, and FM stereo. Brochure showing converters, amplifiers and accessories; also complete '64-'65 dealer catalog plus dealer wall chart of antenna selection by area.
83. **STANDARD KOLLSMAN** — Product literature detailing replacement tuner with preset fine tuning.*
84. **TRIO**—Brochure on installation and materials for improving UHF translator reception.
85. **WINEGARD** — 12-page brochure "Color Spectacular" featuring antenna products designed for color TV use.*
86. **ZENITH**—Information bulletin on antennas, rotors, batteries, tubes, power converters, record changers, picture tubes, wire, and cable.

AUDIO & HI-FI

87. **ADMIRAL** — Folders describing line of equipment; includes black-and-white TV, color TV, radio, and stereo hi-fi.
88. **ATLAS SOUND**—Catalog No. 565 illustrating public-address loudspeakers, microphone stands, and accessories for commercial sound applications.
89. **JENSEN**—Multicolored 24-page catalog No. 165-L featuring speakers and headphones. Also, 22-page catalog No. 6801 supplying phono-cartridge list and cross-reference.*
90. **NUTONE**—Two full-color booklets illustrating built-in stereo music systems and intercom-radio systems. Includes specifications, installing ideas, and prices.
91. **OAKTRON**—"The Blueprint to Better Sound," an 8-page catalog of loudspeakers and baffles giving detailed specifications and list prices.
92. **OXFORD TRANSDUCER**—4-page catalog describing three lines of automobile rear-seat speaker kits.
93. **PHONOLA**—Full-color 18½" x 12" brochure depicting full line of phonographs, tape recorders, and consoles.
94. **QUAM-NICHOLS** — Catalog 65 listing replacement speakers for public address systems, hi-fi, auto radio, and radio-TV applications.*

95. **ROBINS**—Condensed catalog No. 659C covering line of phono- and tape-recorder accessories, replacement parts, and maintenance kits.
96. **SAMPSON**—4-color catalog page illustrating entire line of Waltham transistor radios.
97. **SCOTT**—"1966 Guide to Custom Stereo," a colorful 20-page brochure providing photographs, descriptions, and specifications for stereo components, kits, and speakers.
98. **UNIVERSITY SOUND**—"The Lively Sound," a pamphlet giving specifications, photographs, and details of speaker systems.

COMMUNICATIONS

99. **MOSLEY ELECTRONICS**—Catalog covering complete 1966 line of Citizens-band equipment.*
100. **PEARCE-SIMPSON** — Specification brochure on IBC 301 business-band two-way radio, *Companion II, Director, Escort II, Guardian 23, and Sentry* Citizens-band transceivers. "The Modern Approach to Business Communications" concerning land mobile radio service for businessman.

COMPONENTS

101. **BUSSMANN**—Bulletin SHF-11 on new waterproof in-the-line fuseholder designed for use in circuits located in exposed areas, such as yard lights and marine equipment.*
102. **EBY**—Terminal-block, marker-strip, and connector specifications and cross-reference are covered in catalog No. 6X6.
103. **GC ELECTRONICS** — Cross-reference FR-605-G for TV-knob replacement. Catalog FR-66-TD listing TV antennas and accessories. Brochure FR-171-A and catalog FR-66-A covering audio accessories and solid-state modules. Wall chart FR-250-W providing cross-reference for tape and phono drives and belts. Wall chart FR-029-E listing test prods, plugs, and jacks.
104. **SPRAGUE** — Latest catalog C-616 with complete listing of all stock parts for TV and radio replacement use.*
106. **SWITCHCRAFT**—New-product bulletin No. 155 describing Series X "Glo-Button," a nonelectrically illuminated switch.

SERVICE AIDS

107. **CASTLE**—How to get fast overhaul service on all makes and models of television tuners is described in leaflets. Shipping instructions, labels, and tags are also included.*
108. **CHEMTRONICS**—Flyer sheet detailing tuner cleaner designed for use with color TV.*
109. **ELECTRONIC CHEMICAL** — Catalog sheet describing aerosol cleaners for electrical contacts, volume controls, and tape heads.
110. **PERMACEL**—Product data sheet listing uses and specifications of plastic tapes.
111. **PRECISION TUNER** — Literature supplying information on complete low-cost repair and alignment service for any TV tuner.*
112. **RAWN**—Bulletins covering methods and uses for *Plas-T-Pair* knob and plastic repair kits.
113. **WALLIN-KNIGHT**—Folder on Reflect-O-Scope, a tool for static convergence of color TV receivers.

114. **YEATS**—The new "back-saving" appliance dolly Model 7 is featured in a four-page booklet describing feather-weight aluminum construction.

SPECIAL EQUIPMENT

115. **ACTION SYSTEMS** — Form No. 762 specifications for signal-alarm controller.
116. **ATR** — Descriptive literature on selling new all-transistor *Karadio* Model 707, having retail price of \$29.95. Other literature on complete line of DC-AC inverters for operating 117-volt PA systems and other electronic gear.
117. **GREYHOUND** — The complete story of the speed, convenience, and special service provided by the Greyhound. Package Express routes.
118. **PERMA-POWER** — Four-page catalog, GB281, illustrating solid-state garage-door operator using pulse tone modulation.

TECHNICAL PUBLICATIONS

119. **CLEVELAND INSTITUTE OF ELECTRONICS**—Free illustrated brochure describes electronics slide rule and four-lesson instruction course and grading service.*
120. **GENERAL ELECTRIC**—New semiconductor-application notes titled "Transistor Cascade in FM Tuners" No. 90.51, and "An Economical Three-Stage, Four-Transistor 10.7 MHz IF Strip," No. 90.52.
121. **HOWARD W. SAMS** — Literature describing popular and informative publications on radio and TV servicing, communications, audio, hi-fi, and industrial electronics, including special new 1966 catalog of technical books on every phase of electronics.*
122. **RCA INSTITUTES** — 64-page book, "Your Career in Electronics," detailing home study courses in telecommunications, solid-state electronics, and drafting. Preparation for FCC license, and courses in mobile communications and computer programming also available.*

TEST EQUIPMENT

123. **B & K**—New 1966 catalog featuring test equipment for color TV, auto radio, and transistor radio servicing, including tube testers designed for testing latest receiving tube types.*
124. **HICKOK** — New flyer detailing selected items of service test equipment.*
125. **JACKSON**—New 8½" x 11" catalog listing full line of test equipment.*
126. **LECTROTECH**—Specifications sheet supplying information on circuitry and applications for black-and-white picture-tube analyzer.*
127. **MERCURY**—Folder supplying information on complete line of test equipment.*
128. **SECO**—Catalog sheet No. 90065 describing Model 900 color-bar generator and Models 88, 98, and 107B tube testers.*
129. **SENCORE**—New 1966 4-color catalog showing latest equipment including models CR128A, SS137, and SM112A.*
130. **SIMPSON**—Flyer giving specifications of Model 604 Multicorder for measuring and recording volts, amps, milliamps, and microamps.
131. **SPECO**—Multicolor folder listing features and specifications of multimeter line.
132. **TRIPLETT** — Complete information on burnout-proof VOM Model 630-PLK.*
133. **WORKMAN** — Catalog sheet No. 92C describing transistor/diode checker which uses a tone signal to indicate condition of unit under test.

TOOLS

134. **ENTERPRISE DEVELOPMENT**—Time-saving techniques in brochure from Endeco demonstrate improved desoldering and resoldering techniques for speeding and simplifying operations on PC boards.

TUBES & TRANSISTORS

135. **IEC**—Flyer sheet listing line of tubes for use in home-entertainment equipment.
136. **SEMITRONICS**—New 1966 wall-chart replacement and interchangeability guide for transistors, rectifiers, and diodes.

USE THE HANDY CARD BELOW TO OBTAIN FREE CATALOGS & LITERATURE

As a service to its readers, PF REPORTER makes this postpaid card available for your convenience in obtaining current manufacturers' literature.

To use the card simply:

- Circle the numbers corresponding to the numbers of the items appearing either on page 92 or in the "Product Report" department.
- Print your name and address and check your occupation in the spaces provided.
- Tear out lower half of this insert and place in mailbox.

Note the deadline date — Requests received after this cannot be handled.

Subject Index on Reverse Side

JANUARY, 1966

Please indicate number of items you have circled →

OFFER EXPIRES MARCH 1, 1966

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88
89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132
133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154
155	156	157	158	159	160	161															

Print plainly or type below

Name _____

Firm _____

Firm Address _____

City _____ Zone _____ State _____

Did you receive this issue through

Distributor Subscription

Subscription Offer

Enter my subscription to PF REPORTER

3 Years \$10.00 2 Years \$8.00 1 Year \$5.00

Bill Me Remittance Enclosed

Extend Present Subscription

Please check business classification:

Independent Radio, TV Serviceman

Full time Part time

Retailer with Service Department

Industrial Electronics Service

Owner or Manager

Service Manager

Employee

Other (Specify occupation and title)

BOOK REVIEW	81	MISCELLANEOUS	86
Fundamentals of Radio		Solution to December puzzle	
COLOR TV		RADIO	
Raster turns brown and slightly dim CCM	74	Transistor shorts in auto	TS 84
Sync, loss of horizontal and vertical CCM	74		
COMPONENTS		RECORD PLAYERS	
TV fuse guide	83	Servicing small portables	
		—sound or speed, no	67
GENERAL SERVICING		—sound weak and intermittent	67
Square-Wave Test		—speed incorrect	67
—analysis	69		
—integrator theory, multisection	31	TEST EQUIPMENT	
—PC network testing	32	Field Strength, Meter, SENCORE	
—Q determination	70	Model FS 134	60
Tape, uses of electrical	39		
INDEX		TV SERVICING	
5-year Subject-Reference Index	1	Component, one defective,	
		multiple symptoms	28
INDUSTRIAL ELECTRONICS		Vertical bar drifts thru picture	TS 84
Lasers, used in		Yokes won't last	TS 85
—communications	37		
—data processing	77	SYMPACT®	
—drilling	77	Horizontal Oscillator	43
—gyroscopes	38	(Note: Code letters CCM and TS indicate	
—measuring	77	Color Countermeasures and The Trouble-	
—radar	38	shooter respectively.)	
—TV cameras	37		
—welding	38		

FIRST CLASS
 PERMIT No. 1076
 Indianapolis, Ind.

BUSINESS REPLY MAIL

No Postage Necessary If Mailed in the United States

POSTAGE WILL BE PAID BY—

Reader's Literature Service Dept.

PF REPORTER

4300 WEST 62ND STREET

INDIANAPOLIS, IND. 46206

RCA all-new, rare-earth Hi-Lite Color Picture Tubes are being stocked by smart dealers who are ready for the replacement color picture tube business.

why?

Hi-Lite's rare-earth phosphors provide picture brightness unsurpassed in the color TV industry. Natural color reproduction. Great black-and-white pictures, too! **RCA's Hi-Lite Color Picture Tube Line is here. Now! Available in 19-inch and 25-inch rectangulars and 21-inch round tube types.**

What about you? Are you ready for color?

RCA ELECTRONIC COMPONENTS AND DEVICES, HARRISON, N.J.



The Most Trusted Name in Electronics



EXACT REPLACEMENT direct from factory to you



packaged
for your
particular needs



Complete range of high quality circuit breakers to cover every replacement need, packaged for your convenience individually on a display card or 5 per box.

Also, available in 10 card assortment (9 separate ratings) or 10 breakers per unit box (9 separate ratings).

LITTELFUSE

DES PLAINES, ILLINOIS

Circle 61 on literature card